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The AUTOMOBILE

Thirty Cars for the Fray

Boillot Breaks All Records with 99.9 M.P.H.

INDIANAPOLIS, IND., May 27 — *Special Telegram*—Smashing to fragments every record ever made on the Indianapolis Speedway, Georges Boillot, the champion of the French Grand Prix, today shot into first place in his Peugeot, with a speed of nearly 100 miles an hour, in the list of the thirty picked cars which are to line up at the starting line on Saturday for what will probably be the greatest speed contest in the history of the world. Never before have such terrific speeds been so consistently made in practice work.

Tetzlaff Is Third

Goux, the winner of the 500-mile race in 1913, made a splendid showing for second honors in the elimination trials, pushing his Peugeot over a lap at an average speed of 98.3 miles an hour. The American car which made the best performance in the trials was Tetzlaff's Maxwell, which captured third laurels with a speed of 96.65, while Dawson in the Marmon followed close behind Thomas on the Delage, which made 94.75, with a speed of 94 miles an hour.

It is significant to note that fourteen out of the thirty cars to survive the trials are credited with speeds of 90 miles an hour and over.

A number of changes took place today in the list of cars whose speed entitled them to participate in the race before faster competitors took away this right. Anderson, on his third trial in the Stutz, made 90.5 miles an hour, thus jumping well up into the middle of the list. Rickenbacher made a lap in the Duesenberg at 88.25, which threw him into safety, so far as entry was concerned. Haupt's Duesenberg made an even better showing with 89.5 miles per hour, while Wishart's third trial in the Mercer netted him 92.25. Brock's Ray showed 87.75 miles per hour and Chandler drove the Braender Bull Dog into the list at 87.3. Disbrow pushed his Burman to a garrison finish at the last moment and nosed out Keene and the Beaver Bullet with a speed of 87 miles an hour.

Cars Selected

No.	Car	Driver	Time	M.P.H.
7.	Peugeot	Boillot	1:30.13	99.9
6.	Peugeot	Goux	1:32.77	98.3
8.	Maxwell	Tetzlaff	1:33.40	96.65
16.	Delage	Thomas	1:35.20	94.75
26.	Marmon	Dawson	1:36.20	94
25.	Maxwell	Carlson	1:36.60	93.50
22.	Mercer	Bragg	1:36.80	93.3
19.	Mercer	Wishart	1:37.10	92.25
11.	Excelsior	Christiaens	1:39.16	91
4.	Gray Fox	Wilcox	1:39.37	90.45
24.	Stutz	Anderson	1:39.46	90.5
1.	Burman	Burman	1:39.55	90.4
14.	Peugeot	Duray	1:40.00	90
31.	Keeton	Knipper	1:40.48	89.5
43.	Duesenberg	Haupt	1:40.68	89.5
23.	Mercedes	Mulford	1:42.03	88
42.	Duesenberg	Rickenbacher	1:42.11	88.25
18.	Mercedes	DePalma	1:42.12	88.20
2.	Stutz	Cooper	1:42.25	88
48.	Ray	Brock	1:42.47	87.75
10.	Delage	Guyot	1:42.47	87.25
34.	Bugatti	Friedrich	1:42.59	87.5
38.	Braender Bull Dog	Chandler	1:42.81	87.3
12.	Mason	Mason	1:43.22	87
17.	Burman	Disbrow	1:43.70	87
3.	Stutz	Oldfield	1:43.60	86.75
15.	King	Klein	1:43.60	86.75
9.	Sunbeam	Chassagne	1:43.60	86.75
27.	Sunbeam	Grant	1:44.09	86
21.	Mercer	Pullen	1:46.40	84.75

Eliminated

5.	Beaver Bullet	Keene
28.	Stafford	Callahan
29.	Metropol	Horan
32.	Maxwell	
33.	Texas	Clark
35.	Great Western	Jenkins
36.	Great Western	Price
37.	Great Western	Ball
39.	Pope Bullet	Roberts
41.	Washington	Stringer
45.	Tatter	Mazzucco
46.	Rayfield	Hughes
47.	Titze	Melaun
49.	Isotta	Gilhooley

Tuesday's Trials

INDIANAPOLIS, IND., May 26 —*Special Telegram*—Thirteen cars took their qualifying trials today and tonight twenty-three of the forty-five entrants have taken one or two of their qualifying trials and eighteen remain for the finals tomorrow from 10 o'clock until sunset. Several well-known drivers have not yet made their trials including Boillot, and Mulford. Today the Rayfield six to have been driven by Hughes withdrew, due to breaking a cross bridge in the crankcase for supporting the middle bearing. Two features stand out particularly in today's trials, the first being the phenomenal speed of Goux in his Peugeot, putting the old mark of 1.37 at 1.31.71, a speed

of over 98 miles per hour, and the fastest circuit ever made on the Speedway.

The second event, and no less noteworthy one, was that of Tetzlaff in his new Maxwell doing the lap 1.33.40, or at 96.65 miles per hour, a wonderful speed when it is remembered how quickly the Maxwell cars have been put together by Harroun and how short a time they have had to work them out. Harroun has covered himself with glory in his achievements. Today's times are as follows:

Car	Driver	Time	M.P.H.
*Stutz	Oldfield	1:43.60	86.75
Marmon	Dawson	1:36.20	94.
Delage	Thomas	1:35.20	94.75
Burman	Burman	1:39.55	90.4
Mercedes	DePalma	1:46.98	84.25
Maxwell	Tetzlaff	1:33.40	96.65
Peugeot	Goux	1:32.77	98.3
Excelsior	Christiens	1:38.67	90.45
Delage	Guyot	1:43.47	87.25
*Mercer	Wishart	1:39.73	90.25
Beaver-Bullet	Keene	1:43.60	86.75
*Mercer	Pullen	1:46.40	84.75
Maxwell	Carlson	1:36.60	93.50

*Second Trial.

Of the thirteen cars that took their trials today eight traveled the lap at over 90 miles per hour and it looks tonight as if a car to qualify and get within the thirty starters will have to show 85 miles per hour.

First Ten Cars in 1911

Car	Driver	Miles per Hr.
Marmon	Harroun	74.8
Lozier	Mulford	74.28
Fiat	Brown	72.7
Mercedes	Wishart	72.6
Marmon	Dawson	72.3
Simplex	DePalma	71.0
National	Merz	70.3
Amplex	Turner	68.9
Knox	Belcher	68.3
Jackson	Cobe	67.9

First Ten Cars in 1912

Car	Driver	Miles per Hr.
National	Dawson	78.7
Fiat	Tetzlaff	76.6
Mercer	Hughes	76.3
Stutz	Merz	76.0
Schacht	Endicott	73.3
Stutz	Zengel	73.0
White	Jenkins	72.7
Lozier	Herna	71.4
National	Wilcox	69.6
Knox	Mulford	56.2

The qualifying trials will be continued tomorrow and until sundown Wednesday when fifteen of the forty-five entered will be eliminated.

Monday's Trials

INDIANAPOLIS, IND., May 25, 1914—*Special Telegram*—Fifteen of the forty-five cars entered in the 500-mile classic to be run on the Speedway here on Saturday took today one of the three attempts they are given at qualifying for a place among the thirty that will be sent away Saturday. Each car is allowed three trials of a lap each on the speedway and the fastest thirty will be the final contenders.

Today three of the cars made the lap at 90 miles per hour and higher, the most spectacular performance of the day being the little Peugeot with but 183 cubic inches piston displacement. It made the lap in 1:40 flat or at 90 miles per hour. This is a wonderful performance for such a small car and if a motor with 183 cubic inches piston displacement can show such speed what may be expected when motors with 450 cubic inches are as efficient?

Tabulation of Cars and Drivers Entered for the Indianapolis 500-Mile Race, Together

No.	Car	Driver	No. Cyl.	Bore	Stroke	Piston Displ.	How Cast	VALVES		Location	Operation	Magneto	No. Dist.
								Diam.	Lift				
1	Burman	Burman	4	5.1	5.5	449.4	Pairs	(16) 2	.5	Head	Fork Rocker	Remy	2
2	Stutz	Cooper	4	4.8	6	.....	.....	.....	.....	.....	.....	Bosch	....
3	Stutz	Oldfield	4	4.8	6	.....	.....	.....	.....	.....	.....	Bosch	....
4	Gray Fox	Wilcox	4	5	5.5	431.9	Pairs	2.5	.562	Head	.....	Bosch	....
5	Beaver Bullet	Keene	4	5.1	5.5	449.4	Pairs	3	.5	Opposite	2 Camshafts	Bosch	2
6	Peugeot	Goux	4	4.25	7.2	448	Block	1.77	.315	*Head	.....	Bosch	....
7	Peugeot	Boillot	4	4.25	7.2	448	Block	1.77	.315	*Head	.....	Bosch	....
8	Maxwell	Tetzlaff	4	4.2	8	445	Block	2-75	.5	Head	Overhead Camshaft	Bosch	1
9	Excelsior	Christian	6	3.8	6.2	446	Pairs	.....	.....	L-head	Single Camshaft	Bosch	....
10	De Lage	Guyot	4	4.1	7	380.2	Block	(16)2.185	.343	Head	Fork Rocker	(2) Bosch	
12	Sunbeam	Chassagne	6	3	5.9	273	Threes	.....	.....	L-head	Single Camshaft	Bosch	....
13	Mason	Mason	4	4.4	6	360.5	Block	2.185	.375	Head (Hor.)	Vert. Rocker	Undec.	1
14	Peugeot	Duray	4	3	6.1	183	Block	(2)	.....	Head (30 Deg.)	.....	Bosch	....
15	King	Klein	4	5.1	5.5	449.4	Pairs	3.562	.....	Opposite	Two Camshafts	Bosch	2
16	Delage	Thomas	4	4.1	7	380.2	Block	(2) 2.185	.171	Hor.	Fork Rocker	Bosch	2
17	Burman	Disbrow	4	5.1	5.5	449.4	Pairs	(2) 2	.5	Head	Fork Rocker	Remy	2
18	Mercedes	De Palma	6	4.1	5.5	445	Pairs	50 mm.	50 mm.	Head	Side Camshafts	Bosch	....
19	Mercer	Wishart	4	4.8	6.2	445	Pairs	3.437	.....	Opposite	Two Camshafts	Bosch	2
21	Mercer	Bragg	4	4.8	6.2	445	Pairs	3.437	.....	Opposite	Two Camshafts	Bosch	2
22	Mercer	Pullen	4	3.75	6.75	298.2	.....	.....	.....	.....	.....	Bosch	2
23	Mercedes	Mulford	4	4.25	7.2	448	Block	1.77	.315	.....	.....	Bosch	2
24	Stutz	Anderson	4	4.8	5.75	.....	Pairs	.....	.....	.....	.....	Bosch	....
25	Maxwell	Carlson	4	4.2	8	445	Block	2.75	.5	Head	Overhead Camshaft	Bosch	1
26	Marmon	Dawson	4	4.5	7	445	Pairs	2.25	.5	Opposite	.....	Bosch	....
27	Sunbeam	Grant	6	3.1	5.9	273	Threes	2.5	.....	Side	One Camshaft	Bosch	....
28	Stafford	Callahan	4	4.2	5.1	290.7	Pairs	(2) 2	.5	Head	Overhead Camshaft	Bosch	1
29	Metropole	Horan	4	4.2	7.1	446	Block	.....	.....	Opposite	Two Camshafts	Undec.	....
31	Keeton	Knipper	4	5.1	5.5	449.4	Pairs	.....	.....	Opposite	Two Camshafts	Remy	2
32	Maxwell	.....	4	4.2	8	445	Block	2.75	.5	Head	Overhead Camshaft	Bosch	1
33	Texas	Clark	4	5.1	5.5	449.4	Pairs	3	.75	Opposite	Two Camshafts	Bosch	2
34	Bugatti	Friedrich	4	3.9	7.1	350	.....	.....	.....	Head	Overhead Camshaft	Bosch	....
35	Great West	Jenkins	4	4.2	8	445	.....	.....	.....	.....	.....	.....	....
36	Great West	Price	4	3.7	5.7	254	.....	.....	.....	.....	.....	.....	....
37	Great West	Radina	4	4.2	8	445	.....	.....	.....	.....	.....	.....	....
38	Brender Bulldog	Chandler	4	4.3	6	350	Block	.....	.....	.....	.....	Bosch	2
39	Pope Bullet	Roberts	4	4.7	5.7	407	Pairs	2.125	.562	Head	Rockers	Bosch	2
41	Washington	Stringer	4	4.7	5.7	407.6	.....	.....	.....	.....	.....	.....	....
42	Dusenberg	Rickenbacher	4	4.4	6	360.5	Block	2.185	.375	Head	Hor. Vert. Rocker	Undec.	....
43	Dusenberg	Haupt	4	4.4	6	360.5	Block	2.185	.375	Head	Hor. Vert. Rocker	Undec.	....
	Tatter	Mazzucco	4	4.1	5.3	286	.....	.....	.....	.....	.....	.....	....
46	Rayfield	Hughes	6	4.1	5.5	442.6	Block	.....	.....	L-Head	Valves Inclined, 2 Camshafts	(2) Mea	1
47	Titze	Melaun	4	5.1	5.5	449	.....	.....	.....	.....	.....	.....	....
48	Ray	Brock	4	5.1	5.5	449.4	Pairs	3.562	.....	Opposite	Two Camshafts	Mea	2
49	Isotta	Gilhooly	4	4.7	6.3	445.8	Pairs (Head a block)	(2) 1.875	.562	Head	(15 Deg.) Overhead Camshaft	Bosch	2
51	Shambaugh	Shambaugh	4	4.67	5.5	369.6	Pairs	2 Exhsts	.....	Head	.....	Bosch	1

*Double Valves.

There was a week ago some talk as to whether Duray would be able to put the little Peugeot into the qualifying ranks and it is today a foregone conclusion that this car will be one of the thirty to start Saturday.

The fastest speed today was made by Caleb Bragg in a Mercer, who made the 2.5 mile lap at 93.3 miles per hour, his time by the automatic timer being 1:35.80 and under the official record of the track, although it has been claimed that in practice last week some of the cars made the lap in 1:36 flat.

Wilcox, in the Gray Fox was next in speed honors at 91 miles per hour, his time being 1:39.16. The three Stutz cars took their first qualifying laps just before sundown this evening and all three made wonderfully consistent performances, two traveling the lap at 86.75 miles per hour, and one making 88. Cooper hung up the high mark, beating out his team-mates Barney Oldfield and Gil Anderson. The time for the Stutz cars were: Anderson, 1:43.77; Oldfield 1:44.00; and Cooper 1:42.25.

All three of the Mercer entries took one trial at the course. Both Sunbeams were out, one driven by Harry Grant taking two of its three qualifying trials; others out were Knipper in his Keeton, Klein in the King, Keene in the Beaver Bullet and Brock in the Ray. The times are:

Car	Driver	Time	M.P.H.
Keeton	Knipper	1:40.48	89.5
Sunbeam	Grant	1.44.09	86.
Mercer	Wishart	1:41.93	88.75
King	Klein	1:43.60	86.75
Ray	Brock	1:43.38	87.
Beaver-Bullet	Keene	1:47.37	83.75
Gray Fox	Wilcox	1:39.16	91.
Mercer	Bragg	1:36.80	93.3
Sunbeam	Chassagne	1:43.60	86.75
Mercer	Pullen	1:47.20	83.
Mercedes	De Palma	1:47.40	83.
Peugeot	Duray	1:40.00	90.
Stutz	Anderson	1:43.77	86.75
Stutz	Oldfield	1:44.00	86.5
Stutz	Cooper	1:42.25	88.

First Ten Cars in 1913

Car	Driver	Miles per Hr.
Peugeot	Goux	75.92
Mercer	Wishart	73.49
Stutz	Merz	73.38
Sunbeam	Guyot	70.92
Mercedes	Pilette	68.14
Grey Fox	Wilcox	67.65
Mercedes	Mulford	66.95
Case	Disbrow	63.08
Mason	Haupt	63.47
Tulsa	Clark	62.99

Recent Road Races Comparing with Indianapolis

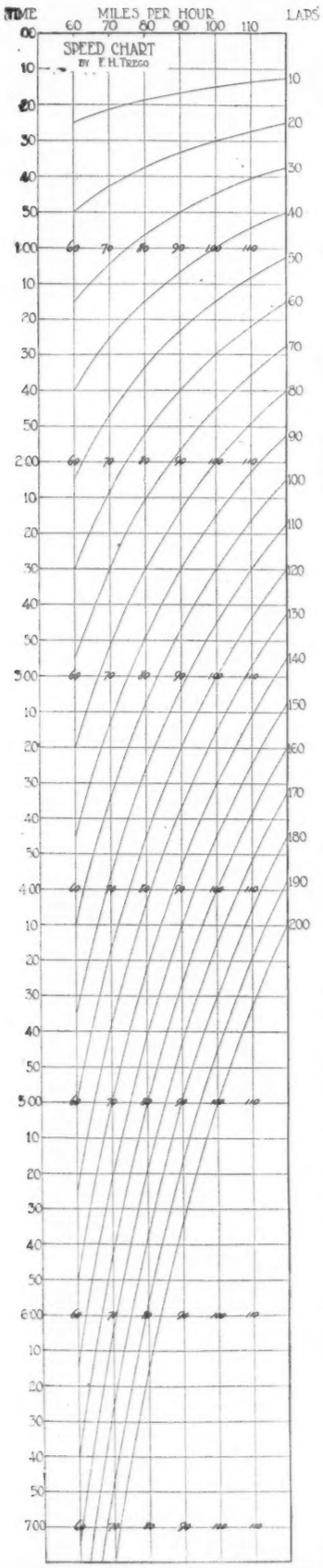
Year	Race	Car	Miles per Hr.
1912	Santa Monica	Fiat	78.71
1914	Grand Prix	Mercer	77.2
1911	Vanderbilt	Mercedes	75.5
1911	Grand Prize	Fiat	74.45
1913	Corona	Stutz	74.7
1911	Santa Monica	National	74.3
1911	Vanderbilt	Lozier	74.07
1912	Vanderbilt	Mercedes	68.97
1912	Elgin	Mercedes	68.90
1912	Grand Prize	Fiat	68.40

Five Sixes

There are five six-cylinder cars entered as follows: two Sunbeams, and one each of Excelsior, Mercedes and Rayfield. Tonight there are twelve foreign cars representing England, France, Belgium, Germany and Italy and thirty-three American cars. The valve in the head motor is one of the characteristics of the cars, there being not fewer than twenty of such of the forty-five entered.

with Mechanical Specifications and Details of Equipment of the Various Machines

No. Dist.	No Plugs	Carbureter	Wheel-base	Gear Rat.	TIRES		Wheels	Final Drive	Shock Absorbers	Plugs	Lubricant	Other Equipment
					Make	Size						
2	8	Rayfield	109.25	2-1	Nassau	33x4.5	Houk	Shaft	Hartford	Undec.	Dixons	Motometer
....	.....	Schebler	.....	.....	.....	.....	Wood	Shaft	Hartford	.....	Dixons	Motometer
....	.....	Schebler	.....	.....	.....	.....	Wood	Shaft	Hartford	.....	Dixons	Motometer
2	.....	Rayfield	96	2.31-1	Not Dec.	34x4.5	Houk	Shaft	Hartford	Undec.	Dixons	Motometer
....	8	Not Dec.	101	Not Dec.	Not Dec.	35x4	Dunlop	Shaft	Hartford	Bosch	Castor and Dixons	Motometer
....	8	Claudel	108	3-1	Dunlop	820x125	Wire	Shaft	Hartford	Bosch	Castor	Motometer
1	8	Claudel	108	3-1	Dunlop	820x125	Wire	Shaft	Hartford	Bosch	Castor	Motometer
....	4	Harroun	105	2-1	Palmer	33x5	Houk	Shaft	Hartford	Bosch	Polarine and Dixons	.....
	2	Rayfields	.....	2-1	Cord	835x150	Adex	Shaft	Hartford	Bosch	Castor, Vacuum and Dixons	.....
....	8	Claudel	104	3-1	Cord	35x6	R-W	Shaft	Hartford	Bosch	Castor	.....
1	2	Longuemare	83	3-1	Dunlop	34x4.5	R-W	Shaft	Hartford	K.L.G.	.....	.....
.....	Schebler	106	2-1	Undec.	34x4-5	Wood	Shaft	Hartford	Bosch	Texaco, Gredag, Dixons	Motometer	
2	8	Claudel	Short	3-1	Undec.	.....	Wire	Shaft	Hartford	.....	.....	.....
2	8	Rayfield	112	2-1	Empire	33x4.5	Houk	Shaft	Hartford	Bosch	Havoline, Oildag, Dixons	.....
	8	Claudel	104	3-1	Cord	35x6	R-W	Shaft	Hartford	Bosch	Castor	.....
2	8	Rayfield	109.25	2-1	Nassau	33x4.5	Houk	Shaft	Hartford	Undec.	Dixons	Motometer
.....	Rayfield	107	2.25-1	Undec.	34x5.5	R-W	Chain	Mercedes	Bosch	Monogram, Oildag, Dixons	.....	
2	8	Rayfield	112	2.25-1	Palmer	880x120	R-W	Shaft	Hartford	Bosch	Castor, Dixons	Motometer
2	8	Rayfield	112	2.25-1	Palmer	880x120	R-W	Shaft	Hartford	Bosch	Castor, Dixons	Motometer
	8	Rayfield	110	3-1	Palmer	35x5	R-W	Shaft	Hartford	Bosch	Castor, Dixons	Motometer
2	8	Rayfield	108	2-1	Braender	895x135	Houk	Chain	Mercedes	Bosch	Castor, Oildag	.....
....	Schebler	.....	.....	.....	.....	Wood	Shaft	Hartford	Undec.	Dixons	Motometer	
1	4	Harroun	105	2-1	Palmer	34x4.5	Houk	Shaft	Hartford	Bosch	Polarine & Dixons	Motometer
....	Schebler	120	2.33-1	.....	895x135	.....	Shaft	Hartford	Bosch	Monogram	.....	
.....	Claudel	116	2.76-1	Palmer	35x5	Steel	Shaft	Hartford	Bosch	Monogram and Dixons	.....	
1	8	Rayfield	111	2.5-1	Miller	34x5	Wire	Shaft	Hartford	Undec.	Texaco and Dixons	Motometer
2	4	H & N	110	Undec.	Nassau	35x5	R-W	Shaft	Hartford	Undec.	Dixons	.....
1	8	Rayfield	.....	2.75-1	Undec.	33x4.5	Houk	Shaft	Hartford	Undec.	Dixons	.....
2	4	Harroun	105	2-1	Palmer	34x4.5	Houk	Shaft	Hartford	Bosch	Polarine and Dixons	Motometer
	8	Rayfield	100	2.66-1	Undec.	35x5	Houk	Shaft	Hart.&Ames	Bosch	Vac., Mobiloil, Oildag, Dix.	Motometer
....	.....	Zenith	Short	.....	Continen.	820x120	.....	Shaft	Hartford	Bosch	.....	.....
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	8	Rayfield	105	2.5-1	Braender	35x5	Dunlop	Shaft	Hartford	Rajah	Oilzum, Oildag, Dixons	Motometer
2	8	Rayfield	124	2.6-1	Undec.	36x5	Wire	Shaft	Hartford	Bosch	Dixons	Motometer
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
....	.....	Master	106	2-1	Undec.	34x4.5	R-W	Shaft	Hartford	Bosch	Texaco, Gredag, Dixons	Motometer
....	.....	Schebler	106	2-1	Undec.	34x4.5	R-W	Shaft	Hartford	Bosch	Texaco, Gredag, Dixons	Motometer
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	12	Rayfield	104	2-5.1	Riverside	34x4.5	R-W	Shaft	Hartford	J-D	Dixons	.....
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	8	Rayfield	108	Undec.	Silvert'wn	33x4.5	Houk	Shaft	Hartford	Undec.	Monogram, Dixons	.....
	8	Longuemare	118	2-1	Palmer	35x5	Riley	Chain	Ames	Bosch	Monogram, Dixons	.....
1	4	Schebler	.....	.....	Silvert'wn	34x4.5	Houk	Shaft	Hartfords	Undec.	Undec.	.....



From time at left, move to right, with reference to number of laps, to intersection of curve, then up to top for average speed.

Indianapolis and Brooklands Greatest Speed Courses

Easier Curves on English Track Make It Faster—Hoosier Course Is of Vitrified Brick Which Becomes Slippery in Heat

THE Indianapolis Speedway will be 5 years old this August, the first races being run over this course in that month in 1909. It was built by the Indianapolis Speedway Co., an organization headed by Carl G. Fisher, A. C. Newby, F. H. Wheeler and J. A. Allison. The construction engineer was P. J. Andrews of New York City.

The surface of the track at the time of the races was hardly completed and as a result several bad accidents occurred. A study of the causes of these brought to light the fact that the surface was not safe and as a result the taroid macadam was replaced by vitrified brick. This surface was completed in the fall of 1909 and races held at that time showed that the new surface was not only fast but safe.

In building the new surface 3,200,000 bricks were required. This surface was laid according to the specifications of the National Paving Brick Manufacturers Assn. and this number of pressed paving bricks was ordered for the purpose.

The course of the Indianapolis Speedway is 2.5 miles long and 50 feet wide on the straight stretches. On the curves the track has a width of 60 feet. The plot of ground required to contain the track parking spaces and stands is 1.5 miles long, .5 mile wide and covers an area of 320 acres. The track takes the form of a rectangle with rounded corners. The two straight stretches are 3,301 feet long and the ends are 660 feet long. Each curve forms a quarter of a circle having a radius 840 feet on the course line or forming 90 degrees of a 6 degree 49-foot 30-inch curve. On the curves the track is banked to an angle of 16 degrees, 40 inches in cross section for 50 feet of their width, the remaining 10 feet of width being banked to an angle of 36 degrees, 40 inches.

Track Pitches Onwardly

The approaches and releases to and from the banked curves are limited to a 2 per cent. grade in sections parallel to the measured course line and the maximum variation from a level plane on the course line is a 2 per cent. gradient. For drainage purpose the straight stretches are given a pitch of .8 in 50 feet toward the infield for drainage.

Running diagonally across the southwest corner of the grounds there is a stream which required the construction of two reinforced concrete bridges to support the track. These bridges are 30 feet wide and 90 feet long and are heavily built. The grand stands are also of a permanent nature being built with an idea of solidity and safety. The main stand, a large covered structure, has a capacity of 10,000. Thirteen smaller grand stands intended for private parties each holding twenty-eight people are ranged around the south turn. In the middle of the south turn is another large stand with bleacher seats having a capacity of 4,200. The main grand stand is 82 feet in width and 500 in length and there are two bleachers, one 500 by 60 feet and the other 350 by 65.

The entire field is inclosed, 3 miles of board fence, 8 feet in height, crowned by bob wire, being required for this. The fence posts are concrete. In the infield there are 7 miles of wire fence and around the track there are 1.5 miles of 8 foot picket fence. In order to permit people to cross the track during the races there are two suspension bridges which enter the infield.

Brooklands Track Is Faster

With all the care that has been given the Indianapolis Speedway it is surpassed as a

FOR ALL 3 YEARS	1911	1912	1913	CAR	DRIVER	TIME	SPEED
FIRST		1ST.		NATIONAL	DAWSON	6:21:06	78.7
SECOND		2ND.		FIAT	TETZLAFF	6:31:29	76.6
THIRD		3RD.		MERCER	HUGHES	6:33:09	76.3
FOURTH		4TH.		STUTZ	MERZ	6:34:40	76.0
FIFTH			1ST.	PEUGEOT	GOUX	6:35:05	75.9
SIXTH	1ST.			MARMON	HARROUN	6:42:08	74.8
SEVENTH	2ND.			LOZIER	MULFORD	6:43:51	74.28
EIGHTH		5TH.		SCHACHT	ENDICOTT	6:46:28	74.0
NINTH			2ND	MERCER	WISHART	6:48:13	73.49
TENTH			3RD	STUTZ	MERZ	6:48:49	73.38

How the contestants would have finished if the entries for the last 3 years had raced together according to their times. Suggested by G. M. Dickson, of the National Motor Vehicle Co.

speed track by the Brooklands motor course at Weybridge Station England. The latter track on account of its shape which is that of an irregular or slightly collapsed oval, furnishes easier curves of greater radius and at the same time the banking is regarded as more efficient. The suface of this track is concrete laid to a depth of from 6 to 8 inches.

The Brooklands speedway is 2 years older than the Indianapolis, having been finished in the Spring of 1907. It is owned by an individual whereas the Indianapolis is the property of a company. The proprietor of the English course is H. F. Locke King who also owns the property upon which it stands. It was the first big track to be constructed for automobile speed contests and at the same time was designed to have a commercial value in carrying on various kinds of tests for the efficiency of cars and equipment. The original motive for constructing the track was for the purpose of giving English manufacturers an opportunity for competing on equal terms with the continental manufacturers.

The Brooklands track has a complete circuit of 2.543 miles or 2 miles 1,350 yards. Running diagonally across the narrow end of the oval is an internal portion of the course which is known as the straight, leading from the circuit of the track to the finishing lines and official buildings. These are located on an open space between the straight and the small end of the oval which is known as the paddock. Between the straight and the northeastern corner of the track are the inclosures, which are located on a natural hillock and provide a natural amphitheater affording an excellent view of the track. Covered stands are here erected for viewing the races and in addition there are lunch rooms, refreshment rooms, cloak rooms, etc., for the accommodation of the spectators.

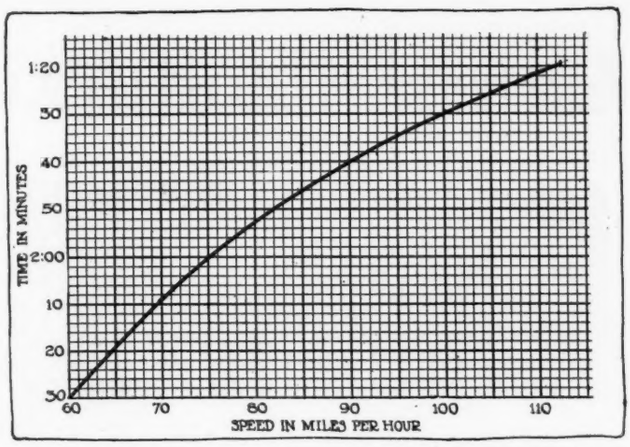


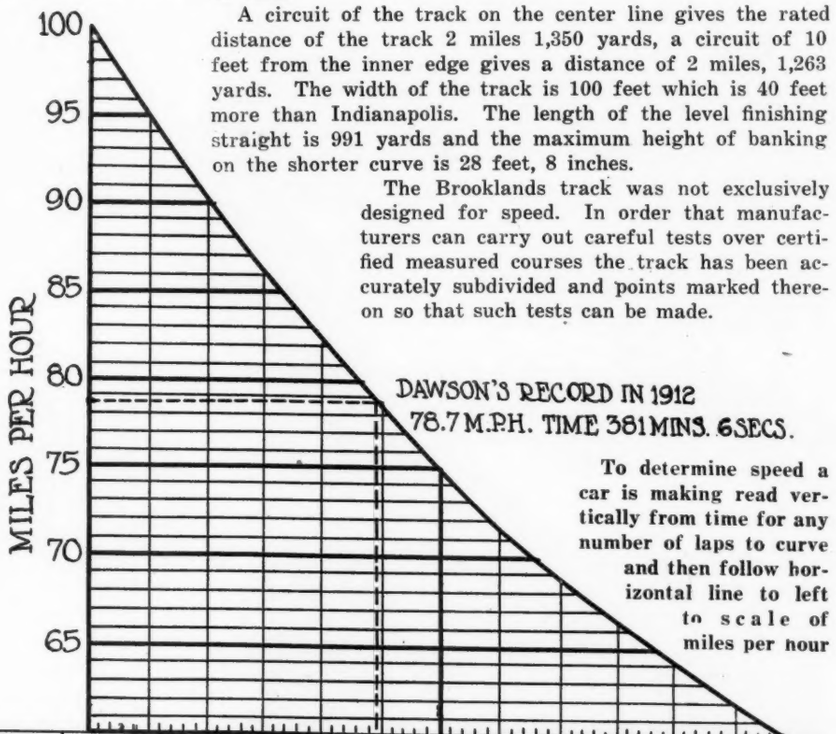
Chart compiled by F. H. Trego, of the Packard Motor Car Company, giving speed in miles per hour for any time required in making a lap

Easy Curves the Speed Secret

The chief reason for the speed of the Brooklands track is in the arrangement of the curves. There are only two of these when the straight is not used and both of these are on a greater radius than the Indianapolis track. On the latter the radius of each of the curves is 840 feet, while on the Brooklands track the sharpest curve at the northern or small end of the oval is 1,000 feet. The mean radius of the longer curve is 1,550 feet. From this it will be seen that this track with its two easy curves is a much less difficult track to negotiate at speed than the Indianapolis Speedway with four curves of lesser radius. The curves of the track have been scientifically banked so that the proper angle can be secured by a car at any speed. The centrifugal force and resultant has been figured out with such accuracy that up to speeds of 100 miles an hour a car at the proper height on the banking has all four wheels pressing equally on the track without tendency to skid.

A circuit of the track on the center line gives the rated distance of the track 2 miles 1,350 yards, a circuit of 10 feet from the inner edge gives a distance of 2 miles, 1,263 yards. The width of the track is 100 feet which is 40 feet more than Indianapolis. The length of the level finishing straight is 991 yards and the maximum height of banking on the shorter curve is 28 feet, 8 inches.

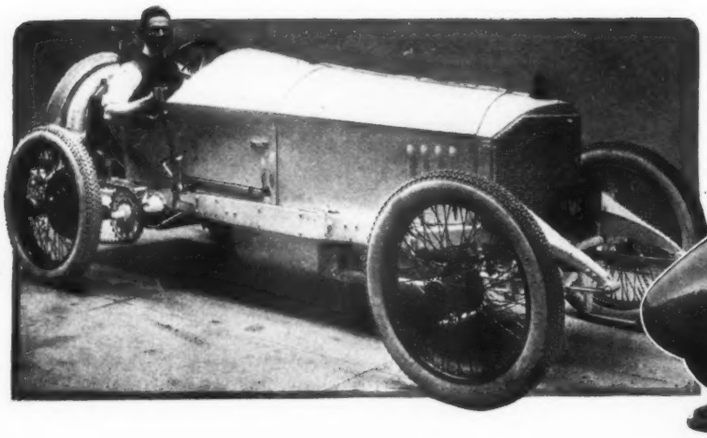
The Brooklands track was not exclusively designed for speed. In order that manufacturers can carry out careful tests over certified measured courses the track has been accurately subdivided and points marked thereon so that such tests can be made.

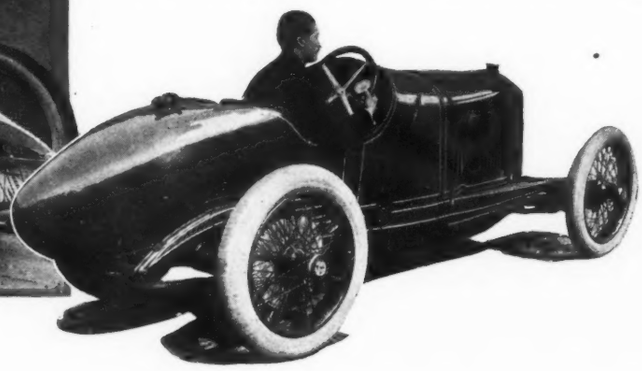


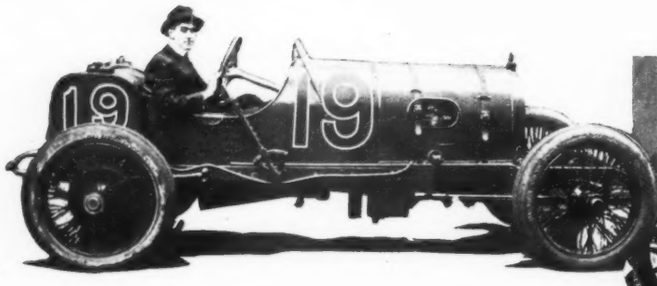
TIME FOR 1 LAP (MIN. & SEC.)	2.5 MILES	1:30	1:35	1:40	1:45	1:50	1:55	2:00	2:5	2:10	2:15	2:20	2:25	2:30
" " 2 " " " "	5 "	3:00	3:10	3:20	3:30	3:40	3:50	4:00	4:10	4:20	4:30	4:40	4:50	5:00
" " 5 " " " "	12.5 "	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30		
" " 10 " " " "	25 "	15	16	17	18	19	20	21	22	23	24	25		
" " 20 " " " "	50 "	30	32	34	36	38	40	42	44	46	48	50		
" " 40 " " " "	100 "	60	64	68	72	76	80	84	88	92	96	100		
" " 100 " " " "	250 "	150	160	170	180	190	200	210	220	230	240	250		
" " 200 " " " "	500 "	300	320	340	360	380	400	420	440	460	480	500		

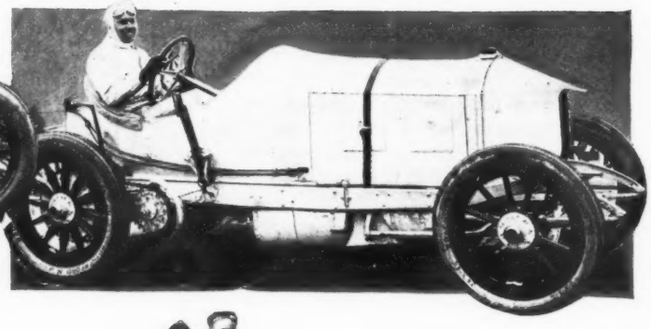
Latest Productions of Racing Car E

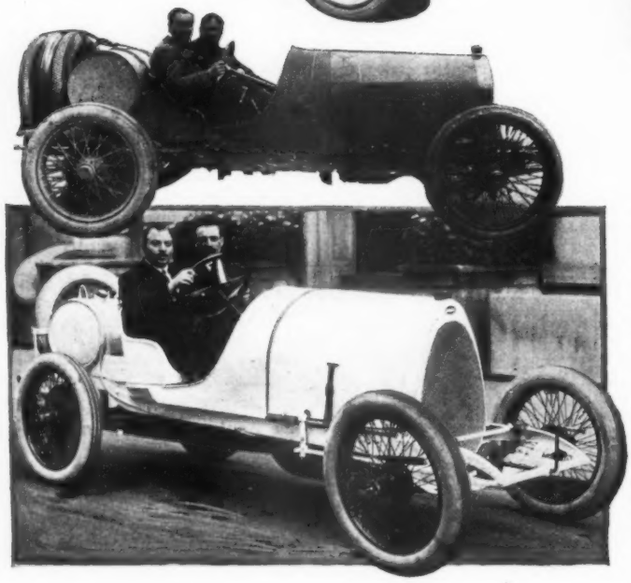
Some of the Cars for the Indianapolis Ra
Development of Maximum Speed, Re











At the upper left corner of the page is illustrated Ralph DePalma in the six-cylinder Mercedes. The streamline design of the car is in accordance with the latest dictates of racing car engineering, every line being adapted to cut down wind resistance to the minimum.

At the right of the Mercedes is a three-quarter rear view of the Peugeot driven by Goux, who won the 500-mile race last year. This car, in addition to having one of the most up-to-date streamline constructions on the Speedway track has many novel details such as leaden weights at the front on the pole side of the car, this being designed to assist in steadying the car when rounding the turns at high speeds.

Below the Mercedes is Spencer Wishart in his Mercer. This is one of the cars which have given such good accounts of themselves in practically all the recent American races of importance. Note the hand hole providing ready access to the carbureter for adjustment.

At Wishart's right is Ralph Mulford in the four-cylinder Mercedes in which he has run so many creditable races.

Stutz No. 3 stands out as strongly on the page as it did in the elimination trials. Gil Anderson is at the wheel.

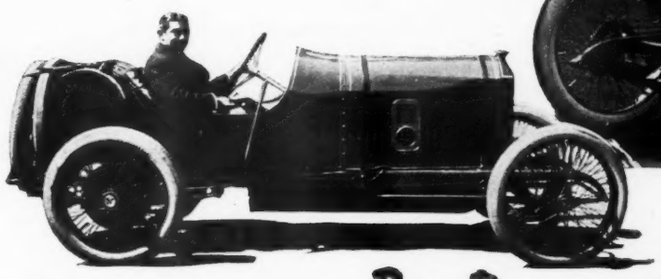
At the right of the Stutz is Clark in the Texas, a new car which made a very good showing in the elimination trials.

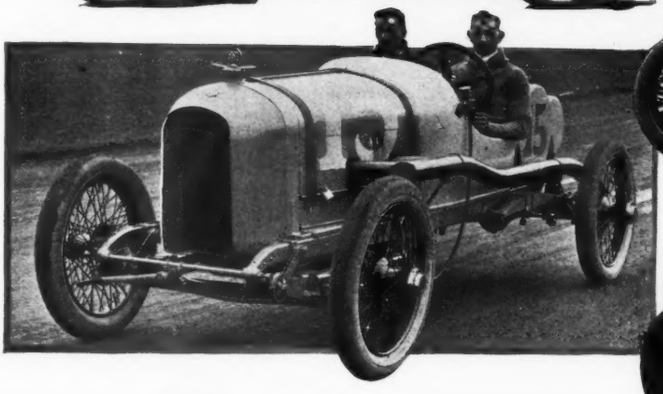
Under the Stutz is the well-known foreign driver, Christiaens, whose Excelsior car is expected to make a fine performance.

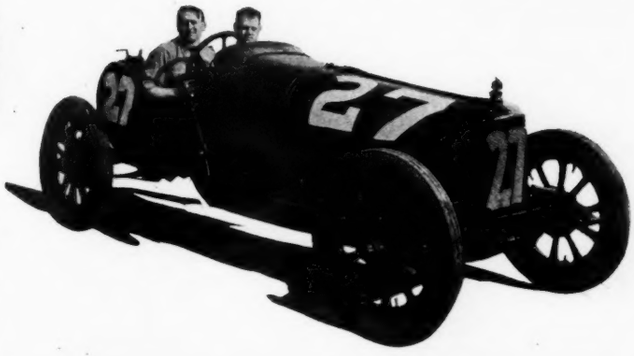
At the bottom of the page is Friedrich, on the Bugatti, a newcomer to the Speedway.

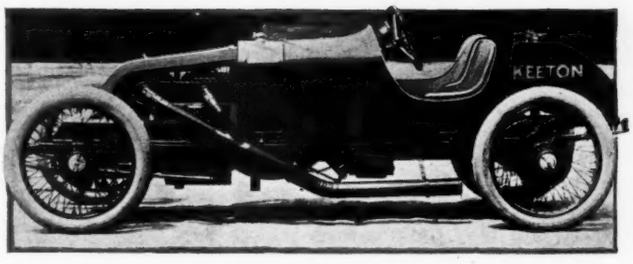
Engineering in Europe and America

Race Which Exemplify Scientific Reduction of Wind Resistance, Etc.









At the upper right corner of the page Teddy Tetzlaff is seated at the wheel of the Maxwell racer which embodies some of the latest ideas in racing car engineering. For instance it has a counterbalanced crankshaft instead of a flywheel.

At his left is Boillot, the French Grand Prix champion, in the Peugeot with which he has created some remarkable speed records.

Many eyes will be centered on Eddie Pullen, who won the Grand Prize race at Santa Monica last winter, and his special Mercer, which embodies many interesting engineering departures. It is illustrated as No. 22 at the upper right of the page.

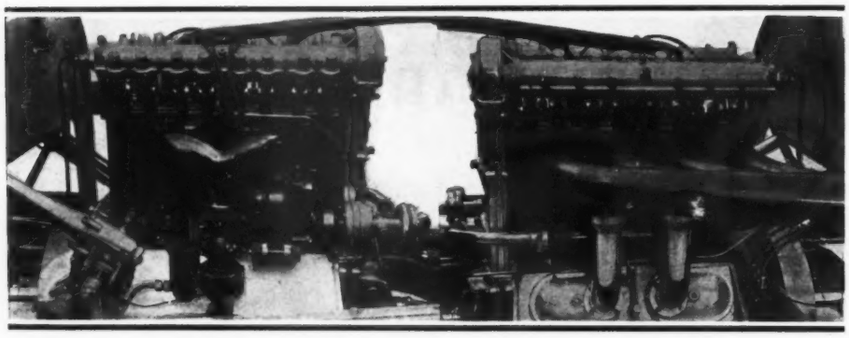
The King is another car which is arousing much comment, it being the first to use the cantilever spring construction in a race. Klein, the boy driver, is shown at the wheel under Boillot's Peugeot.

At the lower right side of the King is Albert Guyot in the Delage which is expected to make an unusually good performance in the race. This is the first time that the Delage has appeared on an American track.

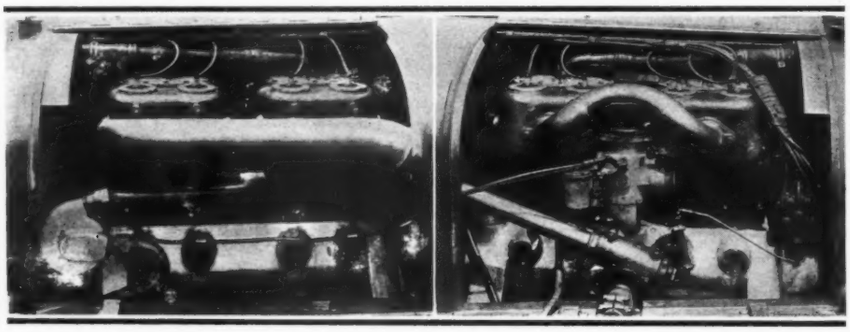
Under the King is Joe Dawson in the Marmon in which he was fifth in 1911. This car made one of the best performances in practice work.

No. 27, at the right is Harry Grant, twice winner of the Vanderbilt Cup race, in the six-cylinder Sunbeam which he is scheduled to drive.

At the bottom of the page is illustrated the Keeton in which Billy Knipper is entered for the 500-mile race. Burman drove this car last year.



Carbureter side of Peugeot motor—Exhaust side of Peugeot motor. Note overhead valve construction



Exhaust side of Wishart's Mercer—Carbureter side of Wishart's Mercer. Note mounting of carbureter

Valves-in-Head Predominate at Speedway

Cleancut Streamline Bodies on Majority—Lighter Reciprocating Parts Used

INDIANAPOLIS, IND., May 22—Forty out of the forty-five entries in the 500-mile race to be held at the speedway on May 30 have put in their appearance and offer an excellent opportunity to study the trend in racing design. The excellence of workmanship which was present last year in the foreign cars to a remarkable extent has been emulated this year by the American designers, and the racing monsters have incorporated refinements which have hitherto been unequaled.

Throughout the racing camps the topic of conversation is the foreign drivers. The success of the Peugeot team last year and the speed shown by the cars from abroad in practice have put the American designers on their mettle, and the result has been a decided trend on the part of the Americans to follow European practice and to endeavor to improve on it. This is particularly true of the cars which have been designed during the past 12 months especially for this race.

The old T-head and L-head constructions which has been the American standby for many years have given way in the newer designed American racers to some type of overhead valve arrangement in nearly every case. The new Maxwells, Burman's new cars and the Stafford are overhead valve constructions, two of them with overhead camshafts, and Burman's car with side camshafts, double valves and forked rocker arms quite similar to the Delage. Hughes' new Rayfield, while not a valve-in-head design, approaches it quite closely in that the valves are set very close to the combustion chamber and are inclined toward the latter.

Lighter Reciprocating Parts

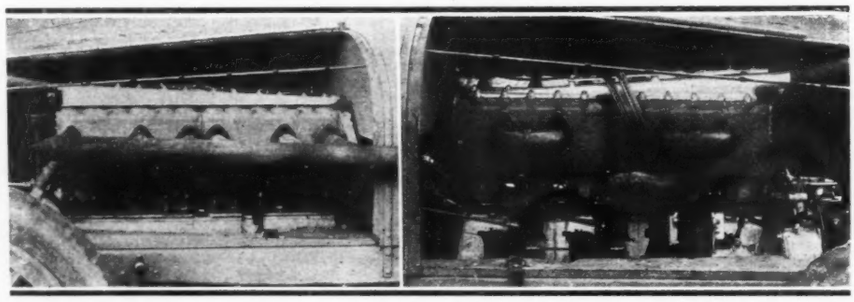
Another tendency which also may be credited to last year's foreign invasion is the attempt toward very light reciprocating parts and lessened vibration, both in the effort to produce high-speed motors. Harroun, Burman, Hughes, Mulford in his Bull Dog, Dusenberg, Delling in the Mercers, and Dawson in the old Marmon, all have been successful in obtaining motors of quite high speed by the lightening of connecting-rod and piston assemblage, by improved balance and oiling systems.

The general sloppiness of many of the American racers of olden days has disappeared in nearly every instance. This may be credited to a certain extent to the showing made by the foreign cars a year ago, whose fine workmanship was generally remarked.

As to the speed creations which have been sent this year from Europe to defend the title wrested from the Americans last Memorial Day, the interest is as high as ever. Seven different makes of foreign cars are on the grounds, and they have come prepared to humble the Americans for the second time. The Peugeots, the Sunbeam, the Isottas and Mercedes, which formed the foreign delegation of 1913, again appear and with their number reinforced. In addition there is the Bugatti, the two Delages and the Excelsior. All of them Europe's fastest speed creations. They all have high-speed motors with exceptionally light reciprocating parts and with very efficient valve mechanism and oiling systems. With two exceptions, the Sunbeam and Excelsior, the overhead valve design is employed. In the case of the Sunbeam, the valve in the head effect is approached with the L-head construction by inclining the valves toward the combustion chamber.

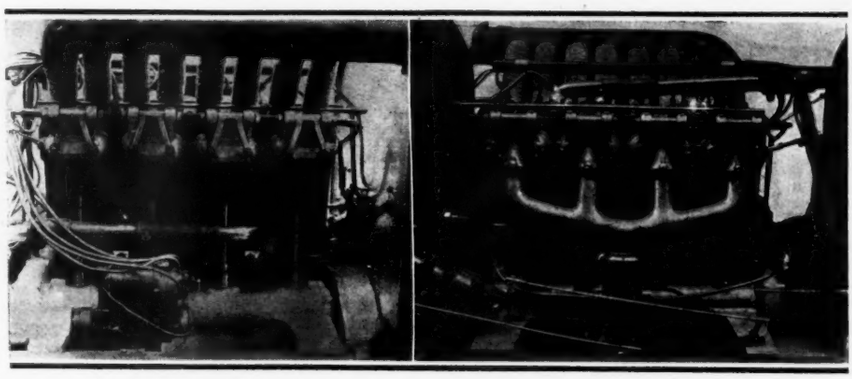
Peugeot Are Amiens Cars

The two Peugeots which are to be driven by Goux and Boillot are the ones that finished first and second at the

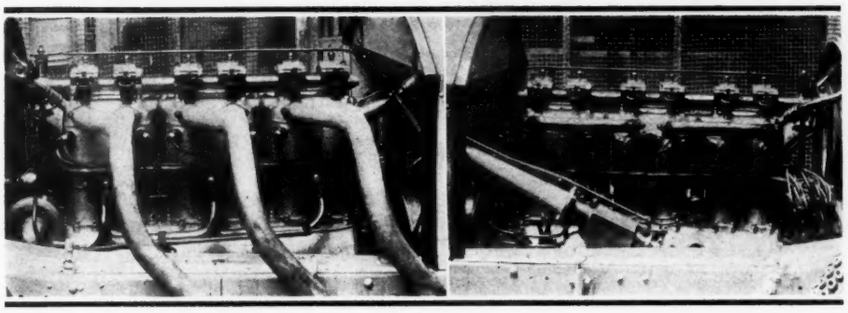


Valve side of Chassagne's six-cylinder Sunbeam—Opposite side of Sunbeam. Note use of two carbureters

Amiens Grand Prix of France at an average speed of 72.1 miles per hour. The two racers have a four-cylinder block motor of 3.9 by 7.08, bore and stroke, giving a displacement of 341.7 cubic inches. In general design they are similar to that of last year's winner. The valves are in the head, and are set into the cylinder at an angle of about 30 degrees. The valves are in duplicate throughout, and the seats are on the under side of the cylinder castings, so that when the valves are raised they are closed. They are operated by a single camshaft running over the top of the cylinders covered by an aluminum housing and driven by a vertical shaft from the crankshaft. The pistons are cut from solid blocks of steel and the crankshaft runs on S.R.O. ball bearings. Oil is forced to the engine bearings at a pressure of 30 pounds per square inch. The pressure employed in most of the American racers is in the neighborhood of 2 pounds. A 3.00 to 1 gear ratio is used and the engine is expected to turn over 3,000 r.p.m. The front springs are underslung this year to get the cars lower and also as a special provision for the speedway. The left frame members have been weighted with lead so that the cars will hold the turns better.



Exhaust and intake sides of the Delage racers designed for the Indianapolis race

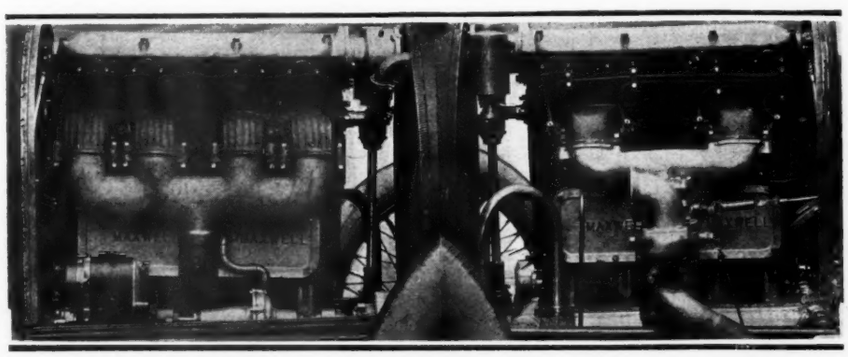


Ralph De Palma's Mercedes, showing exhaust manifolds. Right side of De Palma's Mercedes

Duray's Peugeot is the smallest car in the race. Its piston displacement is only 183 cubic inches, which is only 6 cubic inches greater than that of the Ford and less than that of the smallest Maxwell models. This car is known as the Three-Liter Peugeot, because with it Boillot won last year's Coupé de l' Auto event. It has a bore of 3.07 and a stroke of 6.14 and is considered the most efficient racing motor ever built, the power curve showing 92 horsepower at 2870 revolutions per minute.

Delages Have 130 Horsepower

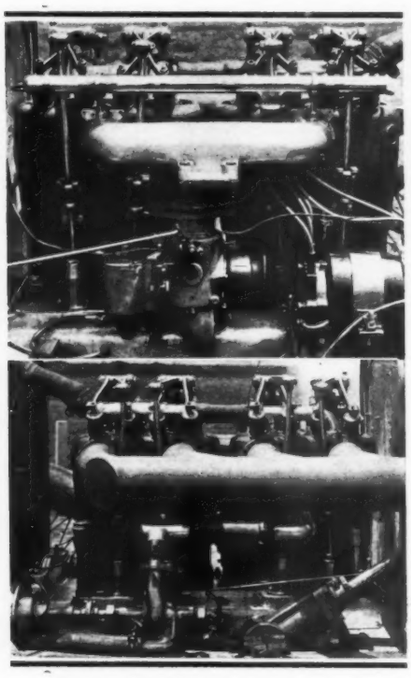
The two Delage cars, which are to be driven by Guyot and Thomas, are the only cars which the Peugeot drivers profess to fear. This is the first appearance of these cars at the Speedway. They are the same in every respect; they have four-cylinder block motors of 4.1 by 7.08 inches. They develop 130 horsepower at 2,800 r.p.m., and both of them are Grand Prix winners. Thomas's machine established the European road racing record of 76.8 miles per hour at Le Mans last summer. This was the car reported to have been bought by an American for the Grand Prix and Vanderbilt at Santa Monica. Delage machines have an enviable record, in that they never have failed to finish their races and never has a bonnet been lifted or a tool used during the race. The cylinders are block cast with four valves per cylinder, mounted horizontally. The crankshaft is carried on five M & D ball bearings and ball bearings are used for crankshaft, pump and magneto shaft. The crankshaft had to be built up on account of the use of the five ball bearings. It is hollow, as are the camshafts, and in order to make the motor rigid and still light, a girder is carried under each main bearing. The valve diameter is 55 millimeters and the lift 9 millimeters. The valve operation is by push-rod and bell crank, each one having two arms and operating a pair of valves. To make these light the valve tappets and push rods are hollow and like the cylinder walls are made light but very strong. The exhaust opening has a lead of 45 degrees and the intake closing a lag of 20 degrees. Steel pistons are used with two rings.



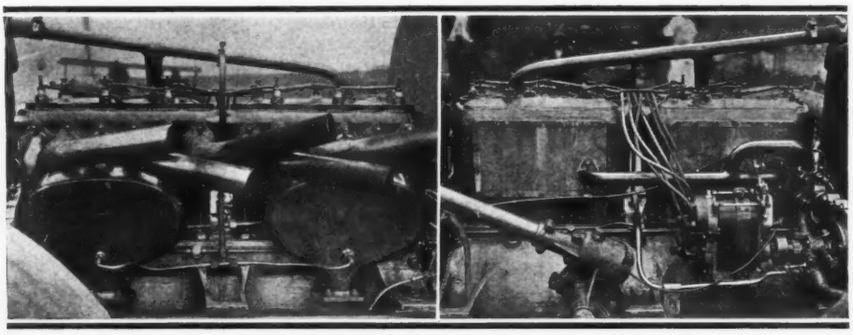
Intake side of Maxwell motor and exhaust side of same motor, showing carbureter and magneto

Excelsior Is a Six

One of the few six-cylinder cars is the Excelsior, which also will be seen for the first time in America. The car is the one that finished eighth in the French Grand Prix at Amiens last year. The valves are on one side, with L-head cylinders cast in threes. Two Claudel carbureters are used with very large manifolds. Crankshaft is carried in seven plain bearings, through which oil is delivered under high pressure. The weight of the car is 1,980 pounds. The reciprocating parts are very light steel pistons and hollow connecting-rods. The cone clutch has a locking arrangement by which the drive shaft is connected directly to the engine to prevent any trouble from a slipping clutch, as this circumstance lost the Excelsior one race. A special four-speed gear box is used which has hollow shafts. The axles have hollow drive shafts which



Right and left sides of Burman motor, showing mounting of the carbureter, magneto and water pump



Valve side of Excelsior. Magneto side of Excelsior six-cylinder motors for Indianapolis

are machined out of the solid. A special radiator for cooling the oil is set in the frame and the feed level is maintained by a vacuum arrangement.

Sunbeam Entries Two Sixes

Of the two six-cylinder Sunbeams, one has been built specially for the speedway and has a wheelbase of only 83 inches. It is to be driven by Chassagne, who has put up several world's records at Brooklands. Grant's car has been campaigned before. This is one of the 1913 Grand Prix de France cars. It has a motor 3.14 by 5.90 inches, giving it a displacement of 273 cubic inches, which is the same as in the standard 16-20 horsepower Sunbeam touring car.

Excepting the engine, the new special car is smaller than the older one. It embodies features which are the result of last year's experiments at Indianapolis, while the chassis is specially built, the motor is the one with which Chassagne made the 12-hour record at Brooklands, averaging 85 miles per hour. A special feature is that it is fitted with two carbureters and two inlet pipes. Its wheelbase is only 83 inches, the shortest in the race, and this necessitated the designing of a special gearbox with very short shaft and giving only two speeds. The oiling system has been changed somewhat in the endeavor to cool the oil. Instead of carrying the most of it in the base chamber it is in a tank at the back of the chassis. A pipe of large diameter, to avoid skin friction, leads from this tank to the pump in the base chamber and oil is forced to all the bearings. A second pump forces it immediately away from the engine back to the tank so that it is not exposed to the engine heat for any length of time. Grant's car is fitted with steel wheels that look like wood.

Stutz Maintains Secrecy

The utmost secrecy is maintained in regard to the construction and design of the three Stutz cars, Harry Stutz being even more averse to giving out details in regard to his entrants than the foreigners who gained their reputation for being so speedy last year. The only authentic information obtainable in regard to the cars is that they are under the displacement limit, have four-cylinder motors, shaft drive with the transmission on the rear axle, Hartford shock absorbers, Bosch magnetos, and Schebler carbureters. It may be assumed that the motor is a T-head type, with cylinders cast in pairs.

Pullen's Mercer a New Car

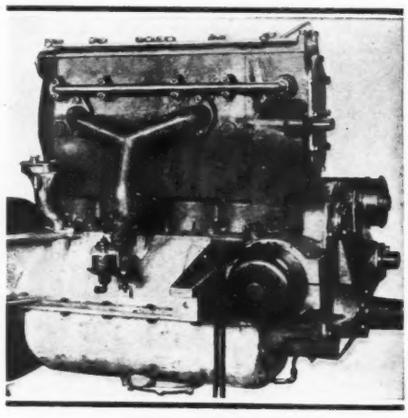
The eyes of many American rooters are on the three Mercers on account of their successes in recent races in this country. Two of them are similar to the entries of last year, while the third, to be driven by Pullen, is of entirely different design. The older Mercers to be driven by Wishart and Bragg are T-head jobs with two-point ignition systems. The magneto is set transversely on the crankcase directly behind the radiator. Both these Mercers have a piston displacement of 445 cubic inches while Pullen's car has 300.7 cubic inches piston displacement. The body of Pullen's car is also different in that it has a decidedly streamline, cigar-shaped effect, a model that has figured largely in record-breaking performances on the Brooklands track. Another way in which the cigar-shaped Mercer differs from the other Mercer cars is in its left drive. This is the first time that a Mercer car has ever had left control.

Pullen's Mercer is designed by Engineer Delling and is reminiscent of the Deltal, a product of the same designer, which finished second at Elgin last year. It has an L-head motor of four cylinders, with a bore and stroke of 4.375 by 5 inches. The gear ratio is 2.5 to 1, the drive by shaft. Palmer cord tires and Rudge-Whitworth wheels are used. This car will be lubricated by castor oil as will the other two Mercers.

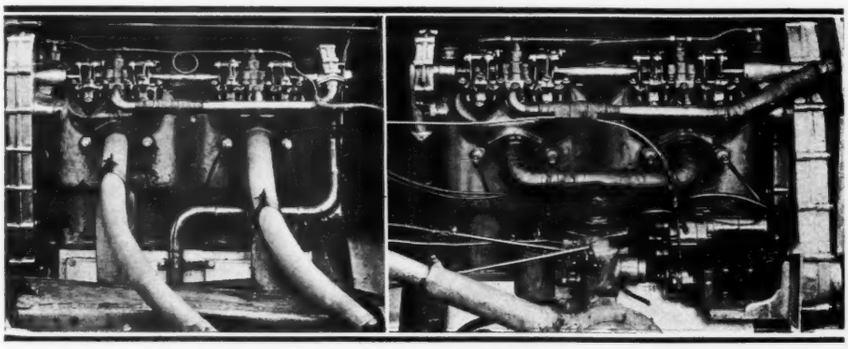
The other two Mercers are 4 13-16 by 6 3-16, have a gear ratio of 2.25 to 1 with shaft drive, Palmer tires and Rudge-Whitworth wheels. The intake header is of ram's horn design and the carbureter is attached to it by an extremely short pipe, in fact, the carbureter feeds only directly into the header without any intermediate mixing chamber. The valves are 3 inches in diameter and have a 7-16-inch width. The carbureter is a Rayfield. The wheelbases of both cars are 112 inches.

Maxwell with Block Motors

The three Maxwell racing cars which Ray Harroun has built and two of which are to be driven by Tetzlaff and Carlson have probably more unusual features than any of the others. One thing about them that impresses the observer is the completeness of the design and the care with which it is carried out. The three cars are alike and have a block motor of 4.2 by 8. The crankshaft is supported on two ball bearings and one plain bearing, Rhine-



Carter piston valve motor for Great Westerns

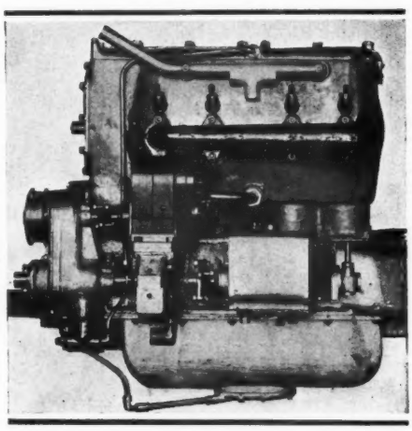


Both sides of Callhan's Stafford, showing overhead camshaft with valves in head of motor

lander bearings being used on crankshafts and camshafts. One of the unique features of the car is that it has no flywheel. The crank throws being upon weighted disks which take the place of the flywheel.

The camshaft operates the valves through short rocker arms pivoted for exhaust and intakes on opposite sides of the housing in the cylinder head. The whole valve mechanism is inclosed by a plate. The reciprocating parts are very light, the pistons are magnalium and weigh 17 ounces. The connecting-rods are chrome steel of webbed I-beam section. Compression chambers are polished inside. The motor has a novel oiling system. The system is so arranged that stopping of the hand pump causes over-lubrication instead of the reverse, a much less serious and more easily remedied difficulty. The oil is forced by an engine-driven pump through large pipes directly from the tank at the rear to the engine bearings, the cylinders being lubricated by the spray, but there is no splash chamber in the crankcase. The excess oil from the bearings gathers in the crankcase, from which it is returned to the oil tank in the rear.

Normally the pump feeds too much oil when the engine is operating at high speeds, so that the crankcase fills up and the engine is over lubricated, unless the hand pump is operated, which forces some of the oil back to the tank through a by-pass without going to the engine.

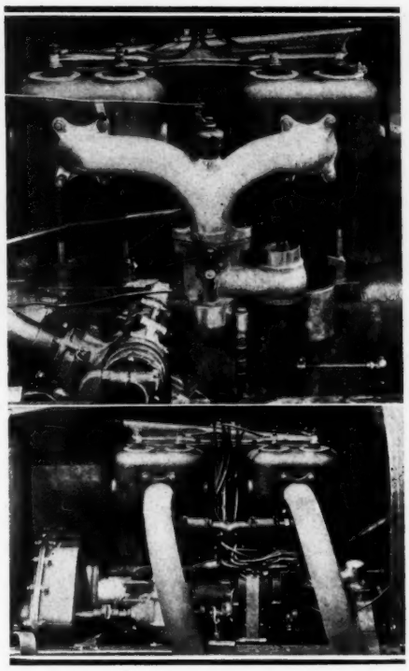


Magneto mounting on Carter piston valve motor

One of the outstanding features is the Harroun carbureter, which is very large and has a big air hood with the pointed screen, is placed outside of the bonnet, and the carbureter adjustment takes the place of the hand throttle. The accelerator alone being used as a throttle. Brakes are operated by cables which are carried through copper tubes. The gasoline tank at the rear has a three point support, being carried on a cross tube at the front and a trunnion at the rear; this to avoid strains and frame twisting. The exhaust gas is taken out in a massive webbed manifold carried down between the cylinders around the base of the carbureter and thence outward. It is possible that Harroun may use kerosene in at least one of the cars.

Marmon Four-Cylinder T-Head

The Marmon driven by Dawson, the winner of the 1912 event, is a private entry by Charles Erbstein, a Chicago lawyer. It is the same car which finished fifth in the 1911 race. It is a four-cylinder T-head motor, 4.5 by 7-inch bore and stroke with 2.25-inch valves on the exhaust side and 2.5 valves on the intake. The valve lift is 7-16 inch. There are three bearings in the crankshaft and the bearing bushings are being made by Murphy Potter. A cone clutch is used, driving through a three-speed gearbox on the rear axle. Gear ratio of 2.16 to 1, tread 56 inches, front tires 880 by 120 millimeters, rear 895 by 135. The weight of the car with tanks empty is approximately 2,700 pounds. Ignition is by the two-point Bosch system, cooling by a cellular radiator located in front of the motor through which the water is circulated by a centrifugal pump. The gasoline is fed to the carbureter from a tank at the rear of the car under pressure furnished by a hand pump. The lubrication of the car is accomplished through a hollow crankshaft with a gear pump for circulating the oil. The wheelbase is 120 inches.



Y-shaped intake manifold on Dawson's Marmon. Below—Exhaust side of Marmon racer

Bugatti Makes Début

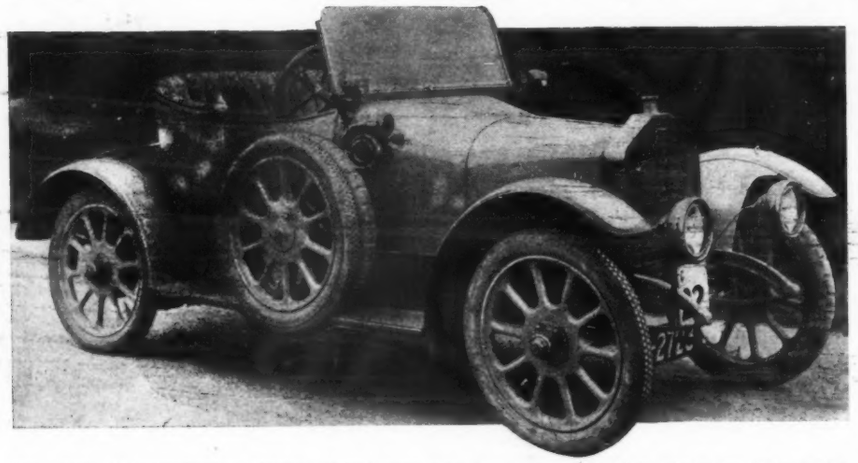
One of the interesting entries is the Bugatti, which makes its début this year. Throughout Europe Bugatti has a reputation which is equal to the best. Its most noticeable achievement being the winning of the recent Tour de France with a clean score with a small car of 65 by 110 millimeters bore and stroke. The machine to be used at Indianapolis is a four-cylinder monoblock of 4 by 7.2 inches bore and stroke, having a piston displacement of 345.08 cubic inches. It has twelve overhead valves, operated by an inclosed valve gear. The use of very fine material has kept the weight to a very low limit.

Triple Combination of Winners

Ralph Mulford's Mercedes entry is one that brings together three winners, Mulford, himself winner of the 1910 Vanderbilt cup, has fitted in the old Schroeder Mercedes which was twice winner of the Vanderbilt, the Peugeot motor in the car which Goux drove to victory in the 500-mile race last year. Mulford tried to enter the Peugeot car complete at Indianapolis, but was unable on account of the rule forbidding more than three cars of one make starting in the race, run under the A.A.A. sanction. He reconstructed the motor and fitted it to De Palma's old war horse in place of the Mercedes engine. The engine is practically the

(*Continued on page* 1134)

Low-Priced Light Cars Win English Run

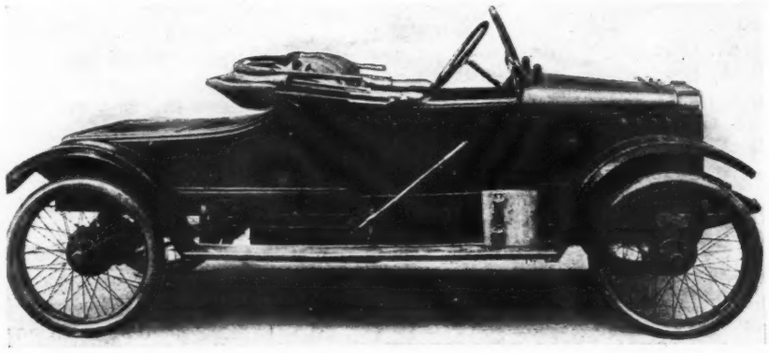


The little 10-horsepower Singer, which won the R. A. C. reliability trials for light cars. The award of the $1,000 trophy was made on all-around performance

Twenty Out of Thirty-Two Starters Finish— Eight Perfect Scores— Winner Averages 35.74 Miles to the Gallon

LONDON, ENG., May 13—The little 10-horsepower Singer driven by F. Rollason has been awarded the prize of $1,000, while the pilot received a gold medal, for making the best showing in the R. A. C. reliability trials for light cars held on May 4 to 9 at Harrowgate. Gold medals were also awarded to T. Roberts, Singer; C. M. Keiller, G. W. K.; J. Broadbent, Hillman; G. W. Wood, Standard; R. P. Robinson, Salmon; and Messrs. S. G. Glicksten, J. G. Pauling and H. Collier, all on Swifts.

The Salmon car was awarded a medal, although it failed to ascend Sutton Bank on the last day, which was due to the fitting of plain tires instead of non-skids. In view of the fact that this car was balked in its passage and forced into rough ground the judges decided to give the award.



The only car of unconventional design to finish the trials with a perfect score—the G. W. K.—which won a gold medal

The winning car, the Singer, is fitted with a four-cylinder engine, 63 by 88 millimeters, or 2.5 by 3.5 inch motor, giving a total piston displacement of 1,096 cubic centimeters, or 63.5 cubic inches. The cylinders are cast in pairs and have their valves all arranged on one side. The cooling is by thermo-syphon with small belt-driven fan behind the radiator. The clutch is an internal leather cone and immediately behind it is placed the universal joint of the propeller shaft, the gearbox being incorporated in the differential casing of the rear axle and provided with three speeds.

The Singer was one of the first of the light cars to be brought out, on large car lines, and to this vehicle considerable credit should be given for demonstrating that for cheap motoring it is not necessary to design and construct hybrid types being neither motorcycles nor automobiles. The performance of the three Swifts was exceptionally good, as these cars were fitted with the smallest engines of any.

The only car which has come through which is of really distinctive design is the G. W. K. friction-driven vehicle. In previous contests and club runs this vehicle has shown up very well indeed, and will certainly tend to popularize the use of friction drive for small vehicles.

It is remarkable that in the dearest class, that is, $1,000 and upwards, not a single machine has come through with a clean sheet. On the other hand, no fewer than four of the nine winners of gold medals for non-stop runs throughout are machines of the cheaper class, not costing more than $750 each. Ten of the thirty-two starters were fitted with two-cylinder engines and as a result of the competition four two-cylinder cars are being awarded gold medals.

The records for the gasoline consumption on the last day's run were very good. The winning Singer made an average of 35.74 miles to the gallon. The best mileage was 43.36 made by the Swift driven by S. Glicksten. The lowest mileage was 22.98 made by B. E. Ellingham's La Ponette. J. G. Pauling's Swift also made an enviable record when it made an average of 40.82 miles to a gallon of gasoline.

The trials were organized by the Royal Automobile Club and the Auto Cycle Union and held under the open competition rules of those two organizations.

First Trials for Light Cars

The trials are in reality the first proper trials for light cars. Previous trials have been organized by the Auto Cycle Union for cyclecars, machines with a maximum engine size of 67 cubic inches, and a maximum weight with body of 700 pounds. The great majority of light cars with engines of the dimensions stated exceed the original weight definition of cyclecars and, therefore, there has never previously been a real trial of cars with an engine capacity of 67 cubic inches.

The first run was 175 miles. The total mileage to be completed in the trials was 1,010½ miles split up into six runs as follows: First day, 175 miles; second day, 187¼ miles;

third day, 164½ miles; fourth day, 175½ miles; fifth day, 176 miles, and the sixth day, 132¼ miles.

Each day there were two non-stop runs, separated by a luncheon interval. The trials were confined to cars having engines with a cylinder capacity not exceeding 85 cubic inches and weighing not more than 1,500 pounds, complete, but without driver, lamps or spare tire. The combined weight of the driver and passenger had to be not less than 300 pounds. The minimum width of the seat allowed for each person was 17 inches.

The cars were divided up into four classes: Class A, price not to exceed $750; Class B, price not to exceed $875; Class C, price not to exceed $1,000, and Class D, price over $1,000. These prices included hood, windshield, head lamp or lamps, side lamps, tail lamp, jack and usual kit of tools. All these accessories, except the lamps, were carried.

Regulations Were Strict

The regulations provided that only 30 minutes were allowed for tire repairs and 15 minutes for brake adjustments during the entire trials. After each day's run the fuel and oil tanks could be replenished, and also at the midday halt. Any repairs or adjustments except the 30 minutes for tires and 15 minutes for brake adjustments were taken off running time. Five minutes were allowed each morning for the starting of the engine, during which time only the following adjustments were permitted: Fitting new battery, turning on gasoline tap, flooding the carbureter, actuating the half compression device if any, switching on the ignition, altering air intake by fingers only—no tool permitted—and turning the starting handle. Nothing could be inserted into the induction pipe or cylinders to facilitate starting.

The Singer, to win the Light Car $1,000 trophy, had to average not less than 17 miles per hour and not more than 19 miles per hour over each portion of the day's route. There were eleven hills scheduled for speed during the week, and the fuel consumption was taken on the concluding run.

The Daily Story of the Runs

The run, on May 4 from Harrowgate, was to Salburn, the route including two of the steepest hills in Yorkshire. The first car to reach the halting place was No. 4 Pilot, and within half an hour no less than twenty-eight out of the thirty-two starters arrived.

On May 5, twenty-seven cars started on the longest day's run of the trials, to Scarborough, via Flamborough and returning via Whitby, the total distance being 187½ miles.

Some Rough Up-Hill Work

There were twenty-four starters on May 6 for the run of 164½ miles to Kirby Stephen, via Wensley, Brough and Appleby, and back through Aisgill, Bedale and Thirsk. This road is comparatively easy as far as gradients are concerned. The roads, however, in parts were very rough,

Results in Saturday's Fuel Economy Trials

Class A—Cars with Maximum Price of $750

No.	Car	M.P.G.	Weight
2.	G. W. K.	36.17	1063
4.	Pilot	25.49	1356
5.	Arden	31.03	1036
6.	Gordon	38.33	1002
10.	Swift	43.36	1078
11.	Swift	40.82	1052
12.	Swift	38.78	1064

Class B—Cars up to $875

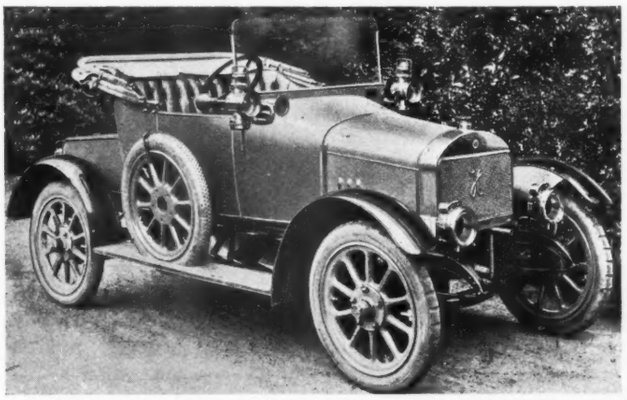
14.	Baby Peugeot	34.07	972
15.	A-C	34.03	1244
16.	Alldays	27.16	1296
18.	Salmon	29.39	1426

Class C—Cars up to $1,000

20.	Hillman	26.85	1492
21.	Hillman	26.84	1462
22.	Singer	35.74	1260
24.	Singer	34.8	1238
25.	A-C	30.23	1224
26.	Standard	31.41	1424

Class D—Cars Costing Over $1,000

33.	La Ponette	22.98	1490



Above—Hillman light car, which finished the R. A. C. trials with a perfect score, and thereby won a gold medal. At right—Standard which finished with a perfect score, winning a gold medal. This car spent only 18 minutes in tire adjustments and repairs

The total mileage completed during the run was 1010 1-2 miles in six runs as follows: First day, 175 miles; second day, 187 1-4 miles; third day, 164 1-2 miles; fourth day, 175 1-2 miles; fifth day, 176 miles, and sixth day, 132 1-4 miles. Each day there were two non-stop runs separated by an interval for luncheon

Specifications of Light Cars in English Trials

CLASS A—CARS AT $750 AND UNDER

No.	Name	H.P.	B. & S. Millimeters	No. Cyls.	Piston Disp. C.C.	Wt.
1.	G. W. K.	8	85.8 by 92	2	1064	1084
2.	G. W. K.	8	85.8 by 92	2	1064	1063
3.	Warne	..	87 by 90	2	1070	908
4.	Pilot	..	60 by 110	4	1244	1356
5.	Arden	8	85.7 by 95.2	2	1098	1036
6.	Gordon	..	85 by 95	2	1074	1002
8.	J. B. S.	10	88 by 90	2	1095	1005
9.	J. B. S.	10	88 by 90	2	1095	1002
10.	Swift	7	75 by 110	2	972	1078
11.	Swift	7	75 by 110	2	972	1052
12.	Swift	7	75 by 110	2	972	1064

CLASS B—CARS AT $875 AND UNDER

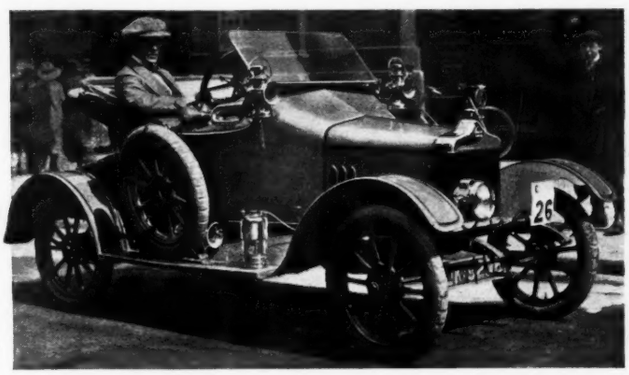
13.	D. L.	6	69 by 90	4	1346	1192
14.	Peugeot Baby	..	55 by 90	4	855	972
15.	A. C.	10	59 by 100	4	1094	1244
16.	Alldays	..	59 by 100	4	1094	1296
17.	Omnium	8-10	59 by 100	4	1094	....
18.	Salmon	11.9	69 by 89	4	1331	1426
19.	Autocrat	..	60 by 95	4	1074	1244

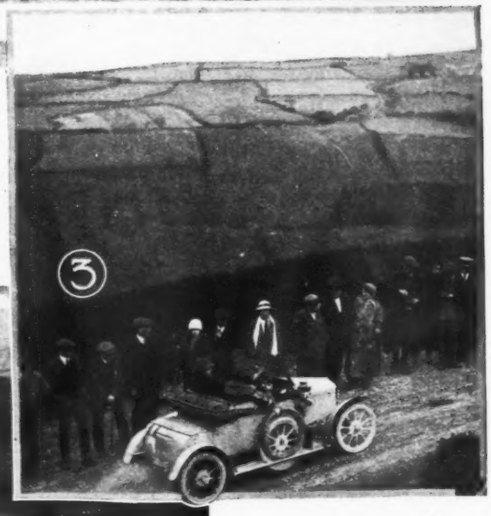
CLASS C—CARS AT $1,000 AND UNDER

20.	Hillman	9	60 by 120	4	1357	1492
21.	Hillman	9	60 by 120	4	1357	1462
22.	Singer	10	63 by 88	4	1097	1260
23.	Singer	10	63 by 88	4	1097	1278
24.	Singer	10	63 by 88	4	1097	1238
25.	A-C	12	65 by 100	4	1327	1224
26.	Standard	9.5	62 by 90	4	1087	1424
28.	Deemster	8-1	62 by 90	4	1087	1130
29.	Sirron	10	66 by 120	4	1357	1468
30.	Charronnette	..	58 by 100	4	1057	1204
31.	Deemster	8-10	62 by 90	4	1087	1130

CLASS D—CARS AT $1,000 AND OVER

32.	Morgan-Adler	9	65 by 98	4	1301	1498
33.	Morgan-Adler	9	65 by 98	4	1301	1452
34.	La Ponette	10	60.9 by 120	4	1398	1490
36.	Sirron	10	60 by 120	4	1357	1484





Scenes Along th[e] English Lig[ht]

THE R. A. C. light car reliability trials held in England May 4 to May 9, inclusive, were the first real trials for light cars. The entry list was open only to cars with a cylinder capacity of less than 85 cubic inches and weighing not more than 1,500 pounds, complete, but without driver, lamps or spare tire. The combined weight

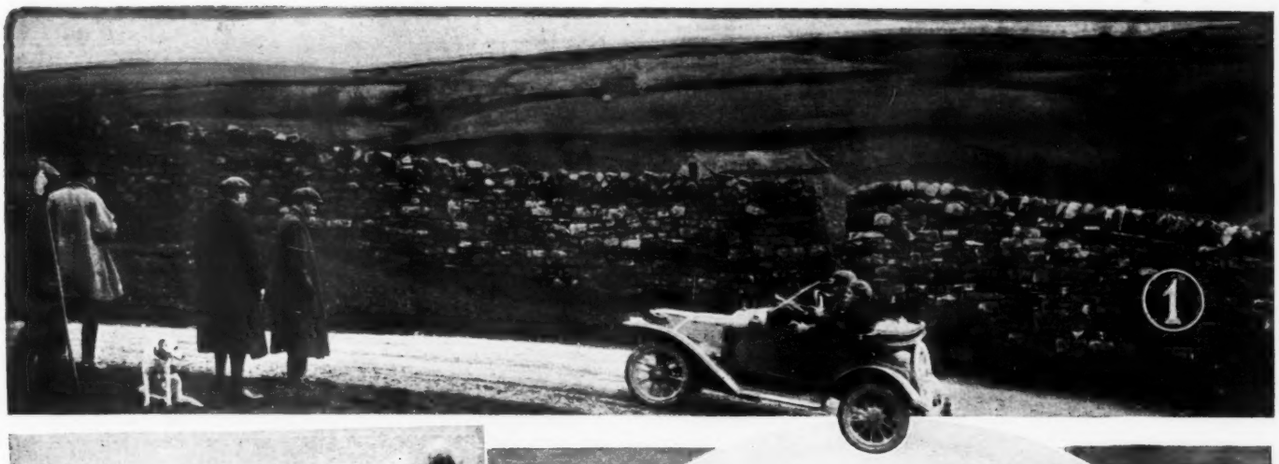
1—Hillman No. 21, which finished the runs of the week with a perfect score and won a gold medal, crossing a control line

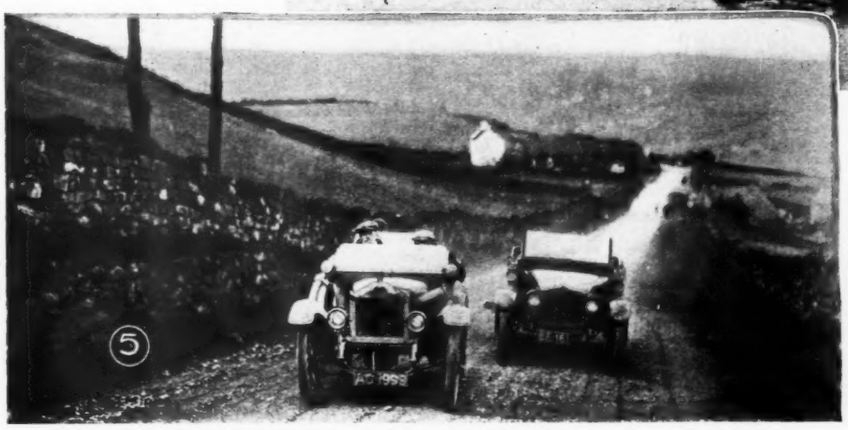
2—Gordon No. 6 rounding a turn at Moss Bank on the R. A. C. reliability trials for light cars

3—No. 6 Gordon having a heavy pull up one of the steep hills included in the English light car reliability trials

4—Two of the little Swifts, Nos. 11 and 12, in hilly country. The Swifts made a fine showing

5—The 9-horsepower Standard, which finished with a perfect score, at Blue Bank hill on the English light car trials





g th ute of the Recent Lig r Trials

of the driver and passenger had to be at least 300 pounds, and the minimum width of seat allowed per person was 17 inches. The cars were divided up into four classes, those costing $750 or under being in Class A, those for $875 and under in Class B, those up to $1,000 in Class C, and those for over $1,000 in Class D. The lower-priced cars made the best showing in the trials, not one of the higher-priced machines finishing with a perfect score.

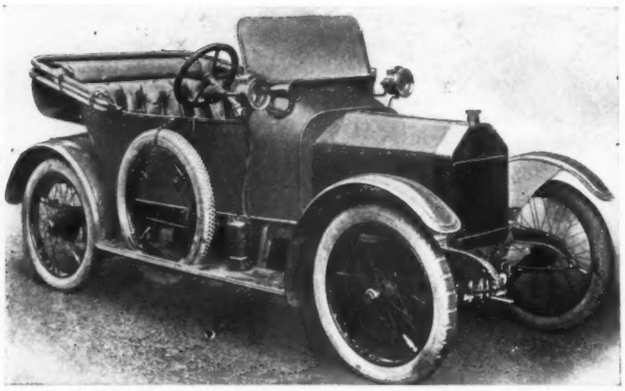
1—The little Charronnette No. 30 pulling up a stiff grade in the R. A. C. reliability trials

2—The 10-horsepower Singer, which won the trials, swinging over the crest in a hill-climbing test

3—Standard No. 26, which finished with a perfect score, going strong on one of the turns

4—The 10-horsepower A. C. No. 15 passing one of the timekeepers along the course

5—Two of the competitors in a brush on Blue Bank hill during the trials



Swift car—Winner of Gold Medal in R. A. C. trials

which made the hill tests more severe than was expected. Scarth Nick presented the worst of the hills on this day's run. It is a very steep and almost disused by-road, a mile and a half long, with a maximum gradient of one in five, but its loose, rocky surface increased the difficulty of the climb. In Class A, the Gordon negotiated the hill in 1:50, while the G. W. K. did it in 1:53. The slowest time was made by the Swift, 3:24. Class B cars failed to do as well, the best time being made by the 10-horsepower A-C, which made the hill in 2 minutes flat. The Alldays did it in 2:04. The A-C in Class C made the fastest time of the day, negotiating the hill in 1:24, with the Singer second, just 3 seconds slower. Class D cars, though the most expensive, did not fare as well, the best time being made by the La Ponette, 1:36, while it took the Morgan-Adler 2:14, the slowest time in that class. It will be noted that in the hill work the more expensive class of car did not show up particularly well as compared with the cheaper machines.

Owing to the retirement of the Morgan-Adler car on May 7, only twenty-three cars lined up for the start of the run of 175½ miles. The roads on this day were thoroughly soaked due to a heavy rain.

The run was by way of Knaresborough, Long Marston, York, Allerton, Boroughbridge, Ripon, Pately Bridge, Grassington, and Gargrave, to Settle for lunch, and return by way of Ribblehead, Hawes Aysgarth, Burnsall, Bolton Abbey, Blubberhouses, Otley Bridge, and Pennypot Lane, back to Harrowgate.

The day's retirements included the Singer No. 23, with broken valve-spring. Also in the final stage of the day's journey the Sirron car No. 36 retired, owing to breakage of the speed lever. This car hitherto had made a succession of non-stop runs.

Thirty-six Non-Stop Runs on May 8

There were twenty non-stop runs on May 8 in the morning, and sixteen in the afternoon. It was a rainy day and the conditions were unpleasant for both drivers and observers. The traveling on this day comprised 176 miles of very difficult country. Every car except the 10-horsepower A-C made a non-stop run in the morning. This car stopped half a minute owing to misfiring, and 16 minutes for a broken water connection in replenishing oil.

In the afternoon 3 minutes were wasted by this car on account of a broken ignition wire and 22 minutes in picking up water. This car had up to this period made an excellent performance.

The Pilot car lost 2½ minutes in adjusting the friction disk on Brownstay Ridge and dropped its passenger. It also lost 3 minutes in excess of the tire allowance time. The Peugeot dropped its passenger on the same hill and picked up water, the same difficulties also befalling the Alldays. The La Ponette stopped and re-started four times on Brownstay Ridge and on another hill not timed, and had to stop and go up on the reverse gear. Ten cars made non-stop runs up to this point. They were the Salmon, two G. W. K.'s, three Swifts, one Hillman, two Singers and one Standard.

Twenty Cars Still Competing on May 9

Out of the thirty-two starters at the commencement of the trials, twenty of the light cars were left on May 9. On that day's run the gasoline consumption was taken and the route was to Scarborough. One of the G. W. K.'s retired from the trials owing to a defective magneto, a short-circuit taking place. This unlooked-for failure was very disappointing, as the car had made a splendid record. With the withdrawal of the G. W. K. and the pardoning of the Salmon, when it failed to ascend the severe Sutton Bank hill, the number of non-stop performances and therefore the winners of the R. A. C. medals was reduced to nine, namely, No. 2 G. W. K., No. 10 Swift, No. 11 Swift, No. 12 Swift, No. 21 Hillman, No. 22 Singer, No. 24 Singer, No. 18 Salmon and No. 26 Standard. Thus 25 per cent. of the starters came through with a clean record. In view of the very onerous task set by the route and the difficult road conditions owing to severe weather, the results may be deemed very satisfactory.

The time spent on tire adjustments and repairs on cars which completed the tour was:

Car	Minutes
G. W. K.	2
Pilot	91
Peugeot	95
A-C	22
Alldays	16
Singer (Winner)	28½
A-C	52½
Standard	18

The time allowed for brake adjustment during the week was 15 minutes. This proved a generous amount as only four cars had to have their brakes adjusted.

Following is a list of the cars which failed to start or which retired from the contest, together with the day and the cause of retirement:

CLASS A

No.	Car	Day	Cause of Retiring
1.	G. W. K.	Thursday	Shorting of magneto
3.	Warne	Tuesday	Engine seized on hill
7.	Non-starter.		
8.	J. B. S.	Monday	Retired
9.	J. B. S.	Monday	Retired

CLASS B

13.	D. L.	Monday	Retired
17.	Non-starter.		
19.	Autocrat	Tuesday	Burst radiator

CLASS C

23.	Singer	Thursday	Broken valve spring
27.	Deemster	Monday	Failed on hill
28.	Deemster	Monday	Float punctured
29.	Sirron	Monday	Overheated on hill

CLASS D

31.	Non-starter		
32.	Morgan Adler	Wednesday	Gear trouble
35.	Non-starter		
36.	Sirron	Thursday	Broken gearshift lever

Salmon—Winner of Gold Medal in R. A. C. trials

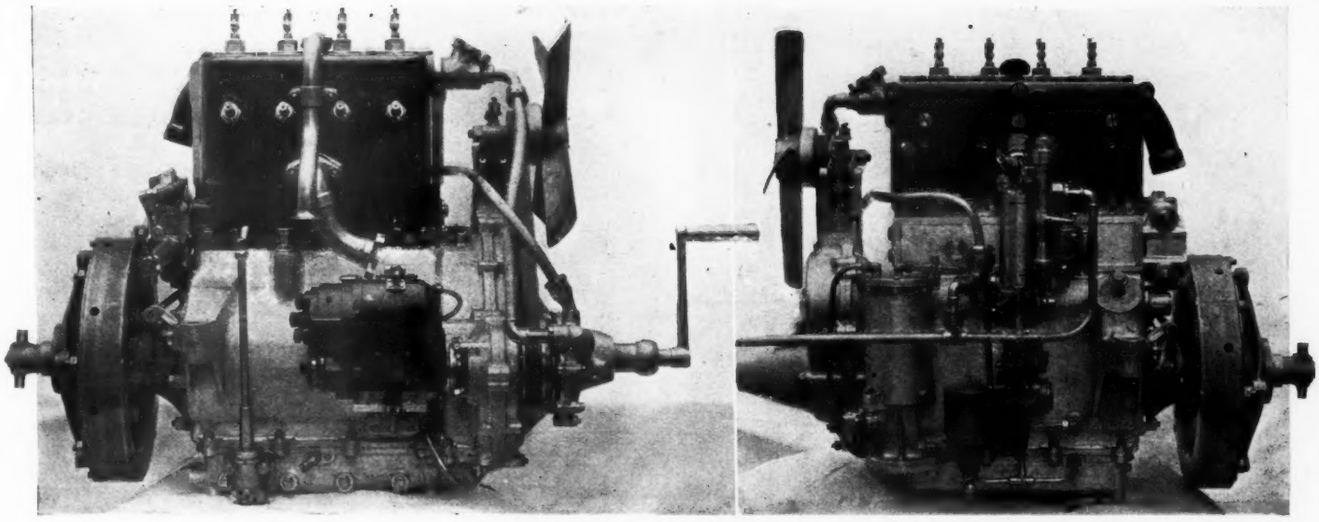


Fig. 1—Left—Rockefeller sleeve-valve motor, showing magneto mounting and spark plug location. Fig. 2—Right—Carbureter side Rockefeller motor with kerosene attachment

Sleeves Replace Poppets in the Rockefeller Motor

Sleeves Can Be Removed Quickly—Are Controlled from Steering Wheel — No Ports in Sleeves—Lubrication by Magnisite—Easy Manufacture—Uses Kerosene as Well as Gasoline

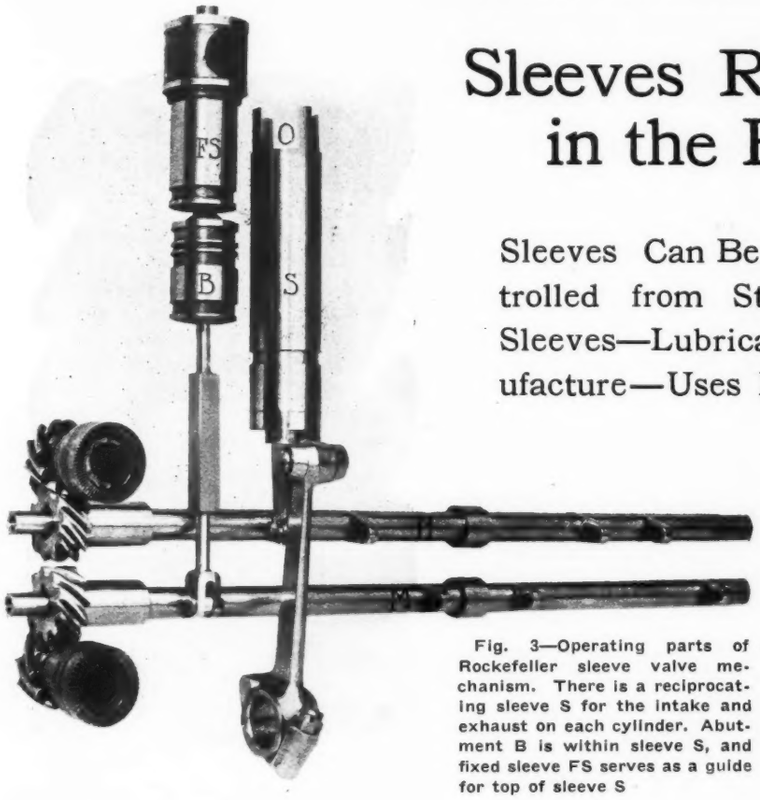


Fig. 3—Operating parts of Rockefeller sleeve valve mechanism. There is a reciprocating sleeve S for the intake and exhaust on each cylinder. Abutment B is within sleeve S, and fixed sleeve FS serves as a guide for top of sleeve S

FOR over 2 years it has been well known in engineering circles that the Perfection Spring Co., Cleveland, O., was developing a form of sleeve-valve motor and carrying out extensive tests on it, and although the expectant public has waited this long it will find many points of particular interest in the Rockefeller motor, which the finished product has been named.

The Rockefeller motor is out-and-out a sleeve-valve type, two sleeves to a cylinder, one sleeve for the intake, and one sleeve for the exhaust. These sleeves occupy the same position that the poppet valve does and bear practically the same relationship in diameter to the piston diameter as do poppet valves. If you have an L-head motor of the Rockefeller type you have the two sleeves side by side, and externally you can scarcely tell whether the motor is a sleeve-valve one or the poppet type. With the T-head type the sleeves would be on opposite sides.

Sleeves are Accessible

But you can go further. The sleeves in the Rockefeller motor are as quickly removed and replaced as is the poppet valve. In 5 minutes an ordinary workman can remove the intake and exhaust sleeves from one cylinder of the motor after it has been running for hours. In slightly more than a minute longer these sleeves can be again put in place and the motor started. This is one of the first sleeve-valve types in which this aspect of accessibility is such a factor.

To go still further, the Rockefeller system of sleeve-valve design is very closely related to standard engineering practice in that to adapt these sleeves to a motor it is only necessary to use different cylinder castings. In other words, the crankcase that serves for a poppet type will serve for the Rockefeller-sleeve type, the layshaft which operates the sleeves working on the same centers as the camshaft which works the poppet valves.

Sleeves Small Like Poppets

Fig. 4, a vertical section of the Rockefeller motor with cylinders 60 by 120 millimeters, shows the general arrangement. This is an L-head motor, and the sliding sleeve S is at the right, this sleeve serving for the exhaust valve and the intake occupying the same relative position but not showing in the illustration. The sleeve is open at its upper and

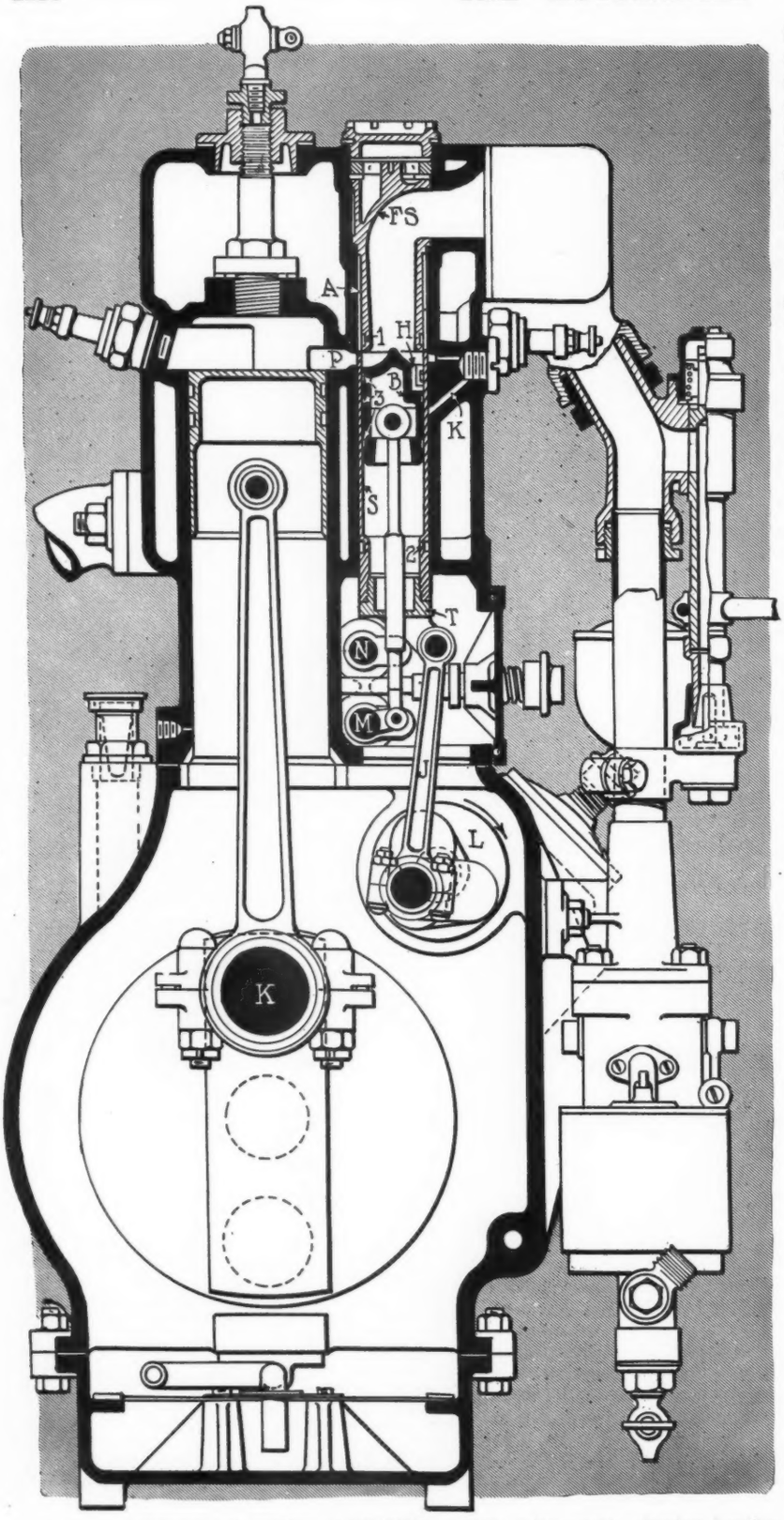


Fig. 4—Vertical end section of Rockefeller sleeve valve motor, showing location of parts. There is reciprocating sleeve S to regulate the intake and a similar one to regulate the exhaust for each cylinder. These sleeves are operated from a layshaft L through a series of connecting-rods J. Above the sleeve is a fixed sleeve FS, which serves as a guide for the top of the reciprocating sleeve, leaving an annular space A, into which the reciprocating sleeve enters. Within the reciprocating sleeve S is a controlling abutment B manually operated from the steering wheel. This abutment regulates the size of the port, directs the flow of gases, and in the exhaust sleeve forms a by-pass in conjunction with passage K to eliminate the motor compression

lower ends and is reciprocated through the connecting rod J, driven from a half-time or layshaft L, which is in reality a small crankshaft. Above the sleeve is what is known as the fixed sleeve FS which threads into the top of the opening for the valve mechanism and extends well downwards, leaving an open annular space A between it and the cylinder casting and into which annular space the top of the sleeve S extends when at the top of the stroke.

Controlling Abutment in Sleeves

Within the reciprocating sleeve S is what is known as a hand-controlled abutment B which can be raised and lowered to regulate the size of the opening or port P into the combustion chamber of the cylinder. This abutment can be raised or lowered from the steering wheel of the car, but otherwise remains stationary within the reciprocating sleeve.

The modus operandi of the sleeve operation is practically the same for the intake as it is for the exhaust. In fact, the sleeves are the same diameter, are of the same length and are reciprocated 60 millimeters, or half the stroke of the piston, so that explaining the operation of the exhaust sleeve will serve to explain the intake. The sleeves are made of either drawn steel tubing 1.5 millimeters thick, or cast iron 2.5 millimeters thick. Each sleeve at its upper end carries four castellations and instead of cutting ports or openings in the sleeve the gases enter or leave through these wide slots in the top of the sleeve, the extension of the sleeve between the slots being merely to form a guide for the sleeve between the fixed part and the cylinder casting.

No Ports in Sleeves

Fig. 3 shows the assembly of the sleeve S with the castellations leaving four openings O in the top of the sleeve, these openings being 6 millimeters or .25-inch deep, and occupying approximately 75 per cent. of the circumference of the sleeve. To the left is the fixed sleeve FS which threads into the cylinder head and below it the manually controlled abutment B which is within the reciprocating sleeve S.

Referring again to Fig. 4, this illustration shows the piston at the end of the exhaust stroke and the sleeve S closing the annular port P. When the piston descends on the suction stroke the exhaust sleeve S continues to rise, leaving the exhaust port P closed through suction, compression and explosion strokes. On the exhaust stroke the sleeve descends, opening port P.

In the intake port the flow of the gases is simply reversed but the sleeve construction and operation are identical. In other words, the gases enter the top of the sleeve and when it opens the port corresponding to P the gases enter the cylinder. As the layshaft L operating the sleeves rotates at half the speed of the crankshaft K there is no difficulty in the timing.

With sleeve-valve motors, sealing, by which is meant preventing the gases from leaking on the compression stroke, is always a factor to be reckoned with and in the Rockefeller this is accomplished by using compression rings in three different places. First there is the compression ring 1 in the stationary or fixed sleeve FS, this ring being intended to prevent gases leaking past the sleeve S when it extends into the annular space A.

At the bottom of the reciprocating sleeve is a compression ring 2 to prevent gases leaking down into the crankcase between the sleeve and the cylinder casting; and, in the abutment B are three compression rings 3. These latter rings are to prevent leakage into the crankcase. All of these rings are Tungsten steel.

Long Opening Dwell

The timing in a sleeve-valve motor has always been advanced as one of the arguments in its favor in that it is posible to keep the intake or exhaust opening at its maximum for a longer period of time than a poppet valve can be held at its point of full opening. This can be best understood when the timing of the Rockefeller is given, which is as follows:

Intake openings 6 degrees before top center.
Intake closes 40 degrees after bottom center.
Exhaust opens 46 degrees before bottom center.
Exhaust closes 6 degrees before top center.

With this timing the intake port on the Rockefeller remains at its wide open position during a period of 117 degrees rotation on the flywheel. In other words, it reaches its maximum opening at 58 degrees and remains to 175 degrees. With the poppet valve, the maximum opening is generally reached at 90 degrees, or when a quarter of the flywheel rotation is over, and remains at this full opening for a period of 40 degrees.

The reason why the Rockefeller sleeve valve, the same as other sleeve valves, obtains a long maximum opening, is that it opens while the piston is at the top of the stroke, and reaches its full opening and retains it while the piston is traveling downwards at its greatest speed, when consequently the greatest demand for gas is made.

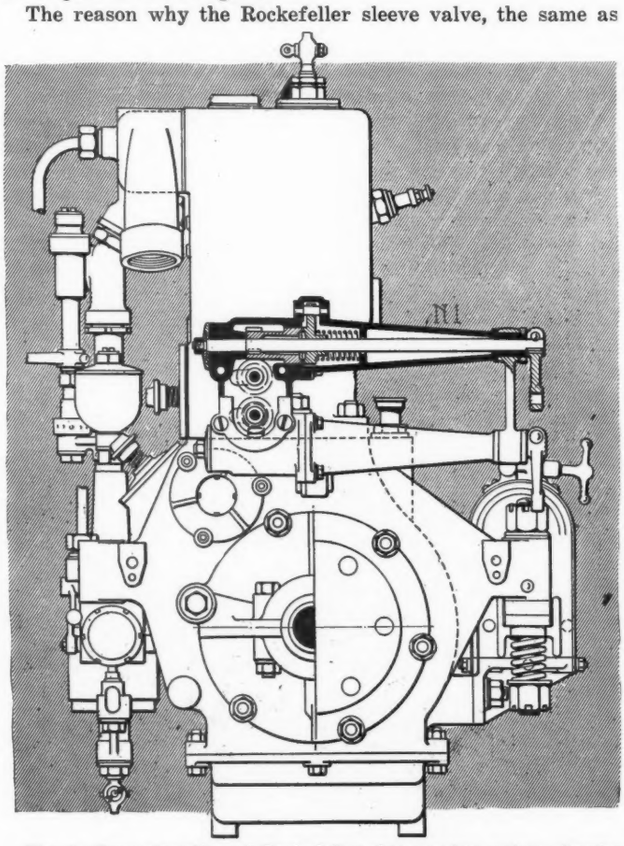


Fig. 6—Rear elevation of Rockefeller sleeve valve motor, showing transverse control rods for regulating the abutments within the intake and exhaust sleeve

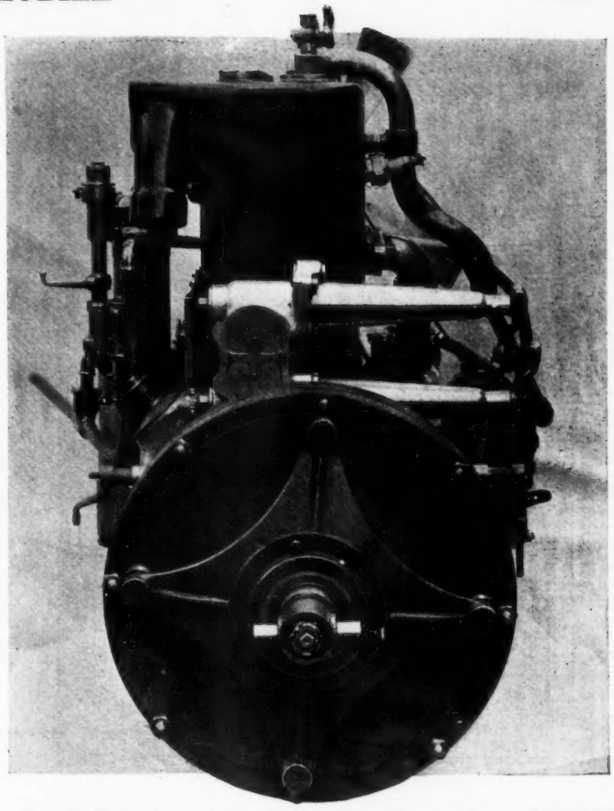


Fig. 5—End view of the Rockefeller sleeve valve motor, with sleeves located on the left side and occupying the same relative space as poppet valves

Lubrication by Magnisite

After timing comes lubrication in a sleeve-valve motor, and, with the Rockefeller, lubrication by oil, in the understood sense of the term, is not used, but a composition known as magnisite is used. Magnisite is made of finely pulverized magnesia and graphite. These are mixed and carried in a compression grease cup on the motor with leads to near the base of each sleeve. This magnisite, in addition to possessing lubricating values because of the graphite, possesses insulating qualities, so that as the reciprocating sleeve becomes coated it resists the heat from the explosion chamber, keeping the valve cool.

In order to make practical use of magnisite as a lubricant, the outside of the reciprocating sleeve S, Fig. 7, is not smooth but threaded from top to bottom with the United States standard thread, eighteen threads or turns to the inch. The object of this threading is that the spaces between the threads fill with magnisite, thus insulating the sleeve, and, further, should any foreign particles get between the sleeve and the castings in which it works, these would be buried in the magnisite in the crevices.

Magnisite Under Test

That this method of lubrication, by resisting the heat, is proving satisfactory has been demonstrated by continuous laboratory tests of many hours' duration. A 6-ounce compression grease cup will hold enough, it is claimed, for 3 months' or a year's use, and in a recent test of 31 hours continuous running the amount of magnisite consumed was scarcely perceptible.

In addition to the outer surface of the reciprocating

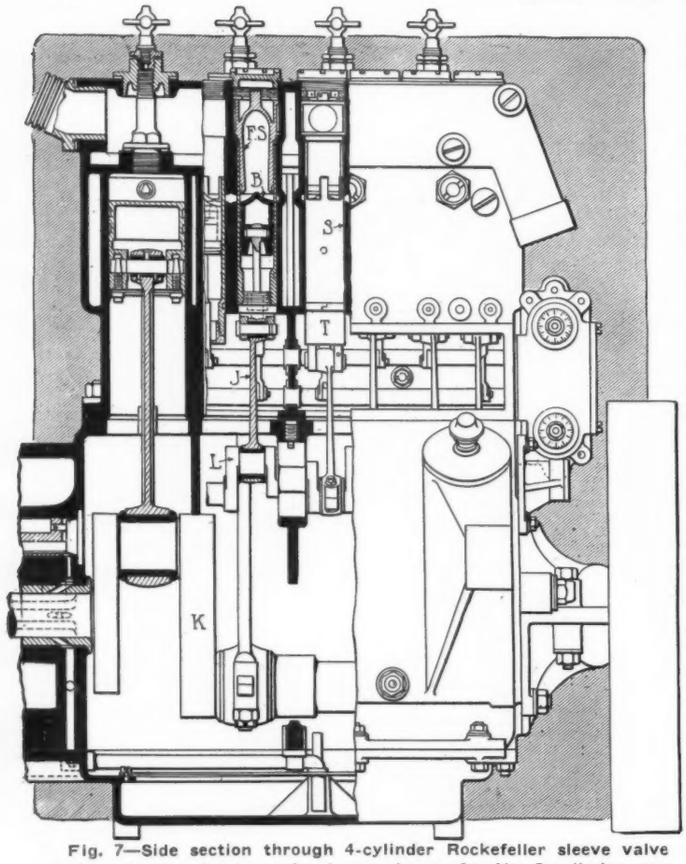


Fig. 7—Side section through 4-cylinder Rockefeller sleeve valve motor, showing intake and exhaust sleeves for No. 2 cylinder, one sleeve in section, the other in elevation

sleeve S being threaded from top to bottom, the outer surface of the abutment B is similarly threaded in order to be coated with magnisite, and the outer surface of the fixed sleeve FS is similarly finished. When the intake or exhaust sleeves are removed after running the motor they are entirely coated with this material, showing how it is distributed throughout the length of the cylinder in which the sleeve reciprocates.

Dynamic Motor Brake

The working of the manually-controlled abutment B within the reciprocating sleeve reveals some interesting facts. This abutment has several duties to perform:

One, by virtue of the gable-shaped top it directs the flow of either intake or exhaust gases.

Two, when going down long hills, by slightly raising the abutment through the control on the steering wheel, you partially close the exhaust valve and thereby accomplish approximately 20 per cent. braking effect on the car.

Three, a third position of this abutment brings into use what is known as the dynamic brake, in which the compression in the cylinder on the compression stroke is relieved during a period of 34 degrees rotation on the flywheel, thereby entirely cutting out the explosions. This is done by lowering the abutment so that the bypass pasage H, Fig. 4, in its top, registers with a bypass channel K in the cylinder casting. When these are in register the gases escape from the combustion chamber through the annular port P, and flowing through the bypass K pass out through the opening H when it is in register, and go on their way to the muffler. Thus the compression is lost and consequently any explosion nullified.

The abutment in the intake sleeve is in reality a separate motor control and is intended to be used instead of the throttle control, in other words, the throttle is left wide open and the speed of the engine regulated by raising or lowering the abutment, thereby restricting the size of the opening into the cylinder. While thus serving as a motor control and intended to be used instead of the throttle in the carbureter, the abutment also serves to direct the flow of the incoming gases.

It is further claimed that by controlling through this abutment instead of through the carbureter throttle, greater economy of fuel is obtained, due to the better carbureter functions obtained by the wide open throttle for slow speed running than with a closed throttle.

The method of raising and lowering these abutments in either intake or exhaust sleeves is shown in Figs. 6 and 8. The abutments for the exhaust are connected with a control shaft M extending from end to end of the motor, within the crankcase, and immediately below the sleeve. Those abutments for controlling the intake are connected with the shaft N, located immediately above the other. At their rear ends these shafts carry spiral gears engaging with cross shafts, one of which N1, Fig. 6, known as the intake rocker shaft, is shown. The end of this rocker shaft carries a short arm for connection with the control on the steering wheel. The relative location of these intake and exhaust abutment rocker shafts as well as housing them in aluminum castings is shown in the rear view of the motor.

Easy Motor Manufacture

From a manufacturing viewpoint, there are not a few details of interest connected with this Rockefeller motor. First, the method of preparing the cylinder casting to receive both the intake and exhaust sleeves is a simple one. In the motor in question the sleeve has an external diameter of 33 millimeters, and as Fig. 4 shows it occupies practically a cylindrical opening in the casting. This opening or hole is finished by broaching, only two cuts being necessary.

The sleeves, as already stated, are either steel tubing or cast iron, and in either case are threaded throughout their length on the outside and ground on the inside. Each sleeve threads into a bottom thimble T, Fig. 4, on which is an ear for attaching the connecting-rod J for reciprocation. By this construction it is but necessary to unthread the sleeve from this thimble in removing it, after which it is lifted out through the top of the opening the same as you would remove a poppet valve. In replacing the sleeve it is necessary to again thread it onto the thimble.

Similarly the abutments B in both intake and exhaust sleeves thread onto a small sleeve, which carries the bushing for the top end of its connecting-rod. This permits of a quick removal of the abutment if necessary.

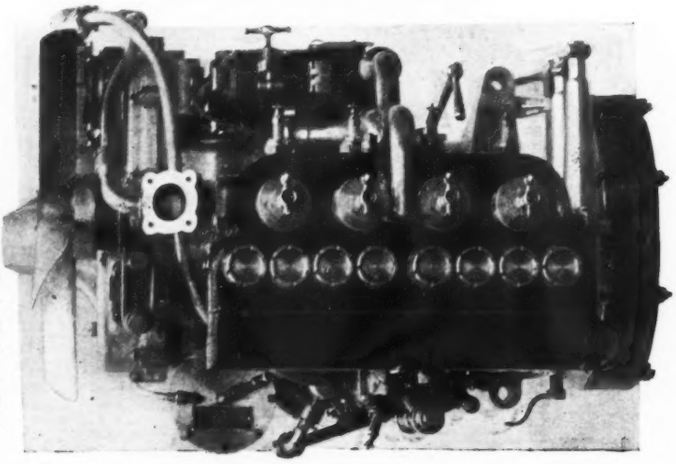


Fig. 8—Top view of 4-cylinder Rockefeller motor, showing 8 valve cover caps the same as in a poppet valve motor. Through these the sleeves are removed

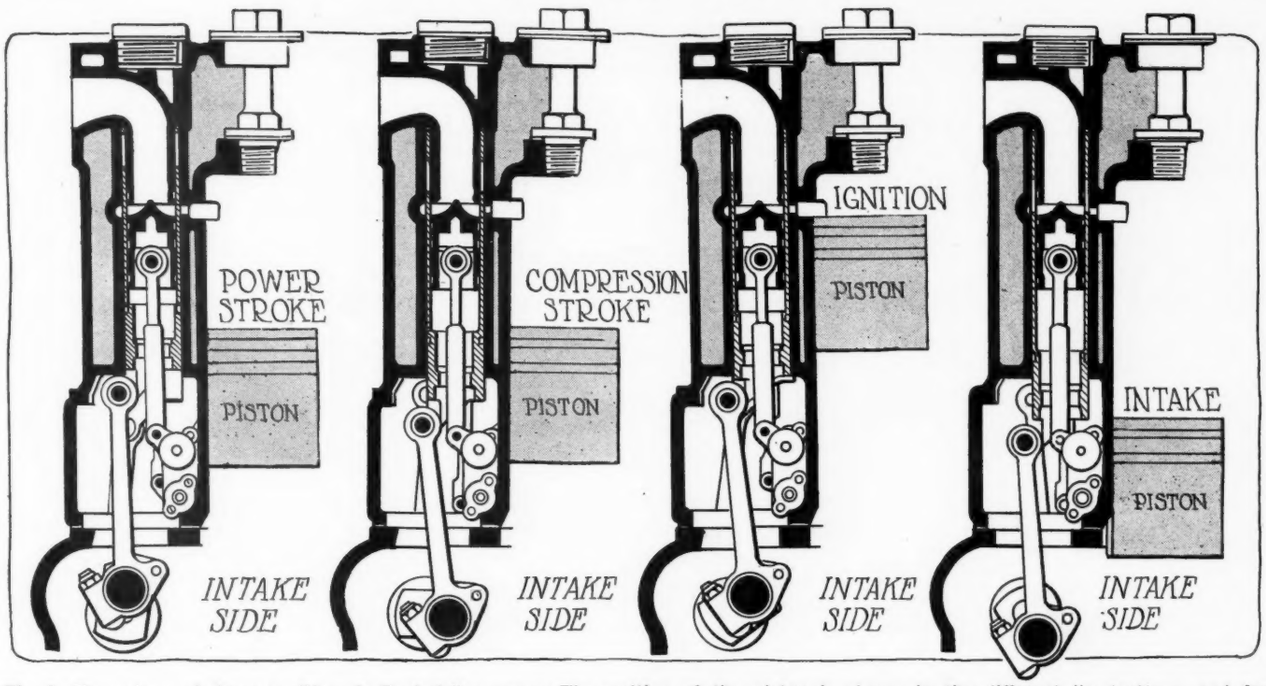


Fig. 9—Four views of sleeve positions in Rockefeller motor. The position of the piston is shown in the different illustrations, and for convenience the other half of the combustion chamber removed in each illustration

By this construction it is readily seen that the three units comprising each valve mechanism are readily removable, first the fixed sleeve FS, Fig. 4, threading into the cylinder casting, second the reciprocating sleeve S threading onto its thimble or base T, and third the abutment B threading onto its connecting-rod.

Motor Uses Kerosene

At present the Rockefeller motor is being tested with either gasoline or kerosene as a fuel, a carbureter suitable of handling either fuel being used. In a test made the motor showed 2,300 revolutions per minute on kerosene and 1,790 revolutions per minute on gasoline carrying its rated load of 11 horsepower at 1,000 feet per minute of test on speed, the maximum power being between 16 and 17 horsepower.

So far as horsepower and torque are concerned, the torque is stated being good from 600 to 1,600 revolutions per minute at which point it begins dropping off up to 2,000 revolutions per minute where it falls off rapidly. The best horsepower is 2,000 revolutions per minute and the best available torque 1,600 revolutions per minute.

What may be considered more or less of a novelty, which is being developed with this motor, is the use of oil cooling instead of water. Oil worth 15 cents per gallon is used and it is claimed that one filling of the cooling system will suffice for an entire season.

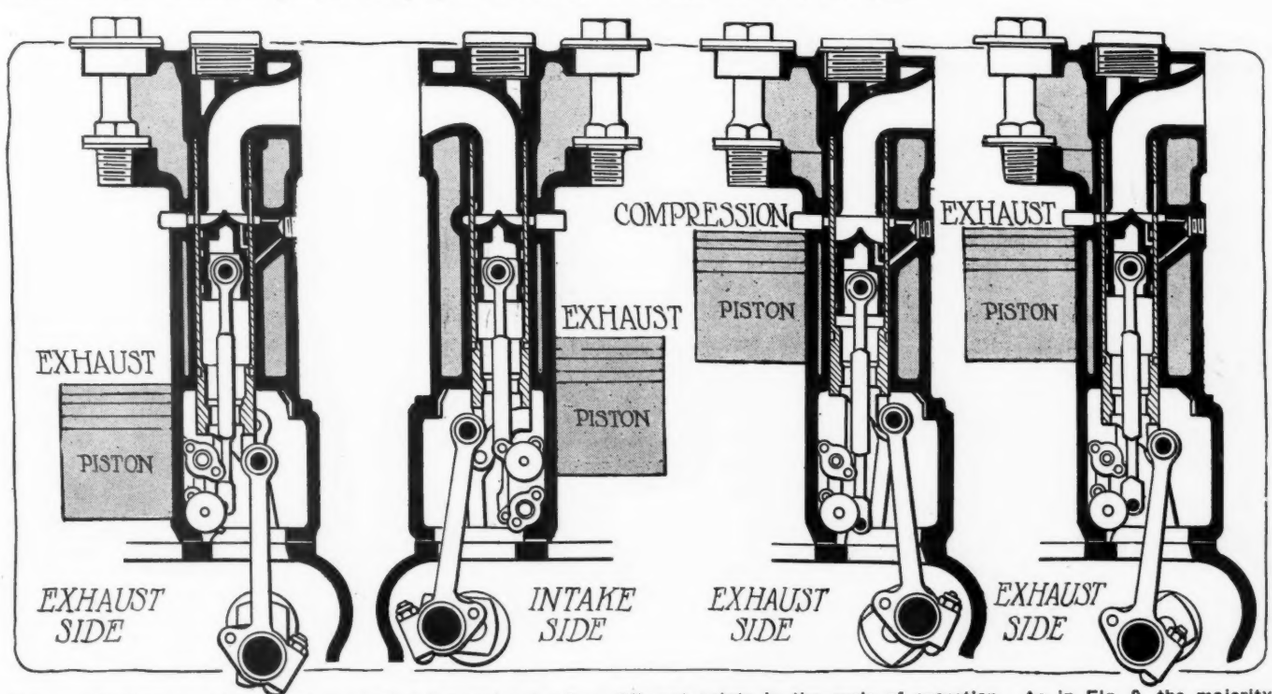


Fig. 10—Position of sleeve valves in Rockefeller motor for four different points in the cycle of operation. As in Fig. 9, the majority of the cylinder has been left off in each

Car, Truck and Accessory Plants Plan Increased Production

Reports from Factories in Buffalo and Syracuse Indicate Bigger Business for 1914 as Compared with Last Year—Trucks Are in Demand—Accessory Plants Booming

Part III

BUFFALO, N. Y., May 23.—Col. Chas. Clifton, treasurer of the Pierce-Arrow Motor Car Co., in a general survey of industrial conditions, not only immediately affecting the motor industry, but embracing the country in general, and in fact looking at things internationally, considers that the present 60 per cent. capacity at which the metal industry is operating pretty truly represents the industrial conditions not only in America but in Canada, Europe, and South America as well. Col. Clifton considers that internationally the world is agog today and passing through an industrial crisis, not a financial crisis such as experienced in 1873 and 1893. He attributes this condition generally to the fact that demand and supply are out of touch with each other; that, in other words, the natural law on political economy laid down by Adam Smith, years ago, is not operating as it should. He considers that production has decreased approximately 40 per cent., being at only 60 per cent. of normal.

Going somewhat further, Col. Clifton by way of analysis of the present industrial crisis thinks that many countries have gone ahead too fast, that there has been too much waste, and that many countries have not been actually making the money they imagined they were. There have been large wastes in government expenditures, heavy wastes in municipal expenditures and a wave of greater expenditure has permeated the great masses of millions of inhabitants throughout this, as well as other countries.

Atterbury Business Mostly in East

The Atterbury Motor Car Co., with its present factory force of ninety-two men, has a production schedule of approximately one truck a day, and shipped eight during the past week. J. R. Spraker, general manager of the company, states that over 60 per cent. of the company's business is made up of repeat orders, and that 90 per cent. of all the business is east of Chicago.

The Atterbury Co. can today be looked upon as an exponent of worm drive, having brought out its first worm-driven models last July, and is now marketing those in 1,500-pounds; 1-ton and 2-ton models. The company has a 3-ton chain-drive type, but expects to convert this into a worm-driven type in the near future. Mr. Spraker states that the general demand throughout the country is for a medium-weight vehicle, preferably of 2 tons, and that it is easier to market such a vehicle at present than a 1,500-pound one, because the purchaser desiring a 2-ton type finds it easier to make an investment of this amount than does the smaller merchant, who requires a 1,500-pound vehicle.

Referring to business generally throughout the country, Mr. Spraker reports conditions in New England generally good with the possible exception that many buyers in Boston and vicinity are wanting to buy on the time payment plan with one-third cash and the remainder in notes of eight months or thereabouts. The demand for 2-ton trucks is very general throughout the industrial world, and such lines of industry as cartage concerns, wholesale grocers, department stores, biscuit and bakery companies, flour mills, etc., are among the leading buyers. One regrettable aspect of the motor truck sales of today is the foolish competition indulged in by several companies. Mr. Spraker cited several examples where Atterbury trucks had been sold, and before delivery was made some rival salesman had attempted to get cancellations of the Atterbury order and the substitution of their truck. In fact, this unfair rivalry in some cases extends still further, cases being on record where spies have been sent to some factories to note in the body-making department what companies bodies were being manufactured for. It is most unfortunate that such unnecessary competition is in existence. There is room for all the makers and what they need is co-operation among themselves rather than injudicious, unbusinesslike methods of this nature. It is but natural that where such selling tactics are resorted to that price-cutting is sure to follow. This condition suggests the necessity of conventions among truck makers so that they will get together and see the folly of such selling methods.

The Atterbury company is located in a large factory with 250,000 square feet of floor space. It has its own extensive wood-working department for manufacturing all styles of bodies, and is at present engaged in entirely reorganizing its various factory departments. The company owns 4 acres of land on which the present factory is located and has every opportunity for advancement.

Stewart Business Retail

The Stewart Motor Corp., which began business in its present plant, 1½ years ago, is now employing sixty-seven men and producing ten to twelve of its 1,500-pound vehicles per week. In its present four-story brick factory, with 77,000 square feet floor area, there is a capacity for 2,000 vehicles per year.

T. R. Lippard, general manager of the company, states that 100 per cent. of the business is retail work, and that they are at present selling vehicles to sixty-five different lines of industry in the retail delivery field. The company has seventy-two dealers and has trucks operating in 100 different cities. In addition the export business is developing, twenty-one trucks having been shipped to Buenos Ayres, South America and regular dealers handling them in such Canadian points as Montreal, Toronto, Ottawa, Winnipeg, Calgary and Edmonton.

According to Mr. Lippard, the retail

business is permeating practically every line of industry today, some of the biggest users being concerns engaged in the following industries: Laundry, bakery, plumbing, ice cream, wholesale tobacco, millinery, hospitals, butchers, furniture, dyeing and cleaning, retail grocery, municipal, etc.

New England Best Market

In analyzing the country industrially, Mr. Lippard reports New England as the best retail delivery market, and cites how small towns in Vermont and Maine are taking up motor delivery. The Pacific Coast was good until last fall, when it experienced a heavy slump, but is now getting back into shape. The great Mississippi valley west of Cleveland, and east of the Rockies, is not so good. The best buying territory in the country is from the Cleveland line east.

For the first 4 months of this year the Stewart Motor Corp. is a little ahead of business for the corresponding months last year, but it has cost slightly more to secure this business. Heretofore the company has, during the 18 months of its existence, concentrated on establishing its entire distribution center over the country, and from this date forward is entering nationally into the selling field.

Mr. Lippard, in speaking of the sales, says that the majority of good salesmen for motor deliveries are obtained from other lines of business, some of the best coming from the hardware and furniture lines. According to him, the touring car salesman has been spoiled in that he has not been educated to go after business as he should, but has been more content to wait until it has come to him. Too many truck salesmen are today knocking the other make of truck, instead of bolstering up the truck business in general. In this respect the truck makers of today are behind the passenger people, who in the early days of their industry accomplished much good by vieing with each other in various contests, which were good advertisements for the entire industry.

Pneumatic Tires Used

The Stewart Corp. sells its vehicles entirely on pneumatic tires, and because of this is practically free from maintenance troubles. Mr. Lippard states that with tires well inflated it is possible to get 5,000 miles. A mileage test was recently made on 6 delivery wagons in the service of a Buffalo daily paper, which averaged 6,227 miles per set of tires per truck. The total mileage of the six trucks follows: The first truck, 8,065 miles; second truck, 6,030 miles; third truck, 4,289 miles; fourth truck, 6,155 miles; fifth truck, 7,653 miles, and sixth truck, 5,172 miles. These trucks in service averaged 175 stops in two hours' delivery work. These mileages give a fairly representative indication of the possible mileage from pneumatic tires when they are well looked after by keeping the inflation up and repairing the tread as needed.

Lippard-Stewart Has Many Repeats

According to H. H. Goodhart, sales manager of the Lippard-Stewart Motor Car Co., the worst problem of today in the merchandising of trucks is the dealer, who takes the truck as a side issue, and devotes the majority of his efforts to marketing passenger cars, which offer a more ready market, and gives the truck business the balance of his activity. This company is distributing its product to approximately forty-five different places, and has exclusive agents in three cities, in all of which the dealer is making a success of the business. Considering the country as a whole, 25 per cent. of the company's business is repeat orders, but in some cities, notably Buffalo, this percentage is as high as 30.

40 Trucks Per Month

At present the Lippard-Stewart Co. is employing between fifty and sixty men and producing upwards of forty trucks per month. The company is located in a three-story brick building, with 50,000 square feet of factory space, having started business in this factory in 1911. The output at present is confined to two vehicles, the original 1,500-pound delivery wagon, with either worm or bevel axle, which constitutes 60 per cent. of the output, and the new 1½-ton, worm-driven truck brought out last September and constituting 40 per cent. of the business. Mr. Goodhart considers worm-drive a large selling factor today.

One of the characteristics of the motor truck industry is the wider distribution, due to such places as Sioux City, Ia., not only actively taking up the truck business, but offering good possibilities. Among the largest consumers of trucks are furniture dealers, bottling concerns, transfer and cartage organizations, bakeries and wholesale grocers. The 1,500-pound vehicle finds a market with department stores, florists, who in general constitute a class well able to buy motor vehicles, retail grocery companies, milk dealers, etc. The factor pushing the retail grocer to buy trucks is that his rival using the motor vehicle is able to make as high as 200 stops a day and to cover 120 miles, thus giving a quicker delivery service, which is a good argument with a housewife. The possibilities of the motor truck in the retail milk delivery were recently demonstrated at Buffalo, where two one-horse wagons required from 2.30 a. m. to 11 a. m. to cover the delivery circuit. This circuit is now being covered between 2.30 and 8.30 a. m. by one motor truck.

200 Fedders Radiators a Day

The Fedders Mfg. Co., with its force of 400 men, is at present manufacturing 200 radiators per day, and expects to increase its production from 40,000 radiators last year to 50,000 for 1914. The company is at present supplying radiators to thirty-five concerns in the motor car and motor truck industry, and during the first 4 months of this year its busines was 15 per cent. greater than in any other four previous months in the history of the company.

That the company is following the general trend of greater economic production is proven by the fact that today with fewer men the factory is producing more radiators than a year ago. Louis Fedders, general manager of the company, has been responsible for many changes whereby the efficiency of the plant has been increased. Special machines have been designed for manufacturing the cooling portion of the radiator. There are 40 machines which convert the sheets of plain copper into the necessary corrugated form to give a cellular structure. In addition are six large machines manufacturing square tubes for the cellular type radiator, each machine manufacturing from the sheet of copper sixty-five tubes per minute. It is these automatic machines, together with the fact that they are operating at higher speeds than heretofore, coupled with improvements in assembly and other factory operations, that make production greater than in previous years.

Automatic Carrier System

The Fedders Mfg. Co. began business in 1897, manufacturing a general line of sheet metal goods, and it was not until 1902 that the active manufacture of radiators was begun. Seven years ago the present four-story brick factory devoted exclusively to the manufacture of radiators was erected. This factory has been operating on schedule all winter, and although there has not been any night work, it has been necessary to work 3 hours longer each day. Throughout the factory improved systems of automatic carriers have been installed and in other places the radiators and radiator parts are conveyed from upper to lower floors though gravity chutes.

Houk Supplies 30 to 40 Makers

The Houk Mfg. Co. has at present manufacturing capacity for 1,000 wire wheels per day of 10 hours, but its ability to manufacture inner hubs is not up to this capacity, the production of inner hubs to meet the varying wheel requirements comprising one of the slow-

est factors connected with the manufacture of wire wheels.

It was on September 23 last that George W. Houk purchased the present plant and 2 weeks later put an addition in the form of a second floor 385 by 65, this addition being solely for the assembling of wheels and the storage of rims and parts. This addition was completed by October 1, but before its completion delivery on wheels had already started. The company is regularly supplying wire wheels to thirty or forty different makers, and the business is increasing 30 per cent. monthly.

The manufacture of wire wheels involves many more features than are generally recognized. The inner hub, or that hub which is secured to the axle, constitutes the most difficult part. It is a casting which has to be machined to meet the requirements of different axle constructions, and naturally must call for considerable time in the manufacture of patterns, etc., before the necessary castings can be made.

With the inner hub completed, the manufacture of the wire wheel itself is a simple process, the wire wheel meaning the outer hub or shell to which the spokes are attached, together with the spokes or rims. The outer shell is of pressed steel piece made in four different sizes to meet the requirements of all cars. The first size is for small cars ranging in price of $600 and under; next comes the $1,000 class; third are the $1,750 to $2,000 machines, and lastly comes the big cars.

The spokes in a wire wheel call for considerable care in that there are three different angles of bend used on the inner ends of the spokes, the bend depending upon the type of hub to be used as well as the diameter of the wheel. At present 102 different sizes of spokes are needed, and the company regularly carries in stock over 1,000,000 spokes, which are purchased from the Standard Co., Torrington, Conn., in boxes of 2,000 each.

Syracuse Factories Adopt Efficiency Methods

Franklin Business 94 Per Cent. in Advance of Last Year —Complete Taylor Systematization of Plant Materially Increases Production—Truck and Accessory Factories Active

SYRACUSE, N. Y., May 23.—H. H. Franklin, president of the H. H. Franklin Mfg. Co., states that from last October until April 30 of this year Franklin business was 61 per cent. ahead of this period a year ago and that during the first 3 months of the present season production and shipments were 94 per cent. in advance of last year. This enormous increase in Franklin business is due to a variety of causes, among which must be considered the fact that the company has dropped its multi-model policy and this year is producing but one chassis, a six-cylinder, air-cooled car, and is manufacturing it in large quantities. The rise of the Franklin company to its present point of importance constitutes one of the most interesting chapters in automobile development in America. This company has been the one concern to draft a policy of its own and to pursue it without deviation up to the present. The present Franklin is a development of the original air-cooled car designed by John Wilkinson, now vice-president of the company and for years chief engineer. On Mr. Wilkinson's shoulders has fallen the entire task involving the car of today, Mr. Franklin controlling the executive end of the business.

Franklin Development

While other concerns have been copying foreign designs, Mr. Wilkinson has been developing his original conceptions of what a motor car should be, namely, a light-weight, flexible vehicle, operated at a minimum cost. To obtain this flexibility, he started in 1902 with his wood frame, adopting this because of the fact that you cannot have strength in rigidity, but must have strength in flexibility. In his quest for flexibility to the wood frame he added the elliptic springs without radius rods, using the precaution of incorporating plenty of metal in the springs. Mr. Wilkinson believes that side-sway is an essential in car flexibility. It saves the wheels, and it saves the tires. Strength is one of the greatest factors in flexibility, and it can be had with lighter weight when a construction is employed in which the strains are distributed not only over greater areas, but also over greater time periods or cycles.

Lower Shock Stresses in Six

Mr. Wilkinson employs the tubular front axle on the ground that it is lighter and stronger than other types. He uses the six-cylinder car because he has lower shock stresses through the driving system, coupled with a possible greater flexibility in driving.

One of the most important factors in flexibility which Mr. Wilkinson has developed throughout his car is that of a nice balance among the different parts in his transmission system, such as the chain of shafting starting with the crankshaft and including clutch shaft, gearset shaft, propeller shaft, rear axle pinion shaft, and axle driveshafts to the rear wheels.

One of the factors in connection with his production that Mr. Franklin is most proud of is the complete Taylor system, which is in operation throughout the entire factory. This system installed some years ago has been worked out satisfactorily in every detail, and is now responsible for the greatly increased production. One of the interesting aspects of this system on the chassis assembly floor is that on either side of the line of chassis going through assembly is a continuous line of crates and shelving on which are placed the different parts entering into the make-up of the chassis. In one crate are the tool boxes, in another the fenders, in another the battery trays, in another the wiring parts, etc. Each tray is located on that part of the floor where it is most convenient to the workmen attaching this particular part to the chassis. With such an arrangement there is little if any waste of time on the part of workmen walking for material.

This system is carried out to the finest detail in the manufacturing departments as well.

Developing Closed Touring Car

One of Mr. Franklin's chief works at present is that of developing what may be termed a closed touring car. Mr. Franklin is an all-year-round tourist and believes that the eventual touring car will not be an open type vehicle as used today, but rather a closed type which, besides being suited to winter use, will have sufficient window space to give every comfort for summer touring. Such a vehicle must be light, free from noise, and with speed possibilities practically the same as the open car of today.

Overtime in Chase Plant

The Chase Motor Truck Co., builders of air and water-cooled motor delivery

wagons and trucks, has been operating on schedule since its manufacturing year opened October 1. The machine shop, for the past 3 months, has been operating until 10 o'clock at night. Last year this company manufactured 1,000 air-cooled delivery wagons, and during the recent New York show announced its line of water-cooled trucks, which have been particularly good sellers, comprising practically 50 per cent. of the business of the company since brought out.

According to E. A. Kingsbury, general manager and secretary and treasurer of the company, from 250 to 275 men are now employed by this company. Business is a little slower at present than a year ago. During March and April there were two short business spurts.

Mr. Kingsbury disposes of the company's output through 450 dealers in America, and in addition has an export trade with South Africa, West Africa, Australia, Brazil, Mexico, etc. Of these dealers, 75 per cent. of them are exclusively engaged in merchandising Chase trucks, and the remainder handle the trucks in addition to passenger cars. Many of the truck dealers are also engaged in the implement business. In order to keep the retail force throughout the country in good selling condition, the Chase company has fifteen district managers, who are constantly traveling throughout the territory and Mr. Kingsbury visits all of his dealers once each year.

Ample Supply of Parts

One good work accomplished by these district managers is that dealers keep up an adequate quota of supply parts, which is a most important factor in truck merchandising.

In analyzing general conditions throughout America, Mr. Kingsbury considers the Pacific Coast particularly good, such cities as Los Angeles, San Francisco, Seattle, Portland and Spokane not only having merchants competent to buy trucks, but these merchants also being of the progressive type. Business in Chicago and vicinity is good.

Palmer-Moore Business Growing

C. L. Palmer, secretary and treasurer of the Palmer-Moore Co., builders of the Palmer-Moore 1,600-2,000-pound vehicle, states that his company got into its present plant in February, 1913, and started deliveries in May a year ago. The company is located in a factory with 47,900 square feet of floor area, and is employing seventy men at present. This company builds but one model and uses the three-cylinder, two-cycle motor, which was developed by Edward Moore, chief engineer of the company. This motor is characterized by controls in the ports on both intake and exhaust sides, so that the carbureter is not regulated but regulation is effected manually by the ports. The company is at present putting out both air and water-cooled types, the water-cooled being in greater demand.

Business Is on the Gain

In looking over industrial conditions in general, Mr. Palmer states that a year ago business started in fine shape and continued until the general slowdown in August, which extended itself well on to February. After that date considerable improvement was shown. This company has recently received one large order for twenty trucks from one company. Mr. Palmer says that the plant and land are entirely clear, and the company should consequently have good prospects for development.

Two Big Brown-Lipe Plants

One of the large Syracuse accessory plants is the Brown-Lipe-Chapin Gear Co., which manufactures nothing but bevel gear differentials for motor cars, and, located but a few blocks from this, is the Brown-Lipe Gear Co., which manufactures nothing but gearsets for motor cars and trucks, both factories being under the same management and controlled by General Manager Chapin. At present 1,000 men are working in the factory manufacturing differentials only, and 250 men in the factory manufacturing gearsets, etc. This number is slightly lower than a year ago, the company considering that general business at present is approximately from 60 to 75 per cent. of normal, this reduction being largely due to the slowness of the truck field.

Last year was the biggest year in the industry so far as this company was concerned, and a part of the slowness this year is due to some makers overstocking a year ago, and overestimating the possibility of production for this season.

Companies More Conservative

The general financial conditions have made several of the motor car companies more conservative than a year ago. A characteristic of business this year has been ordering in smaller quantities than formerly, and orders being correspondingly more frequent. The company considers that present retrenchments are very natural and looks forward to a particularly big trade next year.

Products Are Up to Date

In the Brown-Lipe-Chapin factory, which is a modern factory, opened January, 1910, only bevel gear differentials are manufactured. In the Brown-Lipe factory only spur gear work is carried on, and it is restricted to gearsets, gearsets with clutch constructions and control parts and gearsets to go with jackshafts and rear axles. The company builds gearsets exclusively to its own design and in sizes suited from anything to the light runabout to the 5 or 6-ton truck, and with either three or four forward speeds. This company has been keeping abreast of the development of the industry so far as design and manufacture are concerned.

Dyneto Has New Type

The Dyneto Electric Co., which during the past year was located in Syracuse, has largely confined its manufacturing activities to the Dyneto motor-generator, built on the Entz principle, for Franklin cars, is now ready to begin a new chapter in its manufacturing career in that A. E. Doman, vice-president and engineer of the company, has completed the development and testing of a series of three new combined motor generator machines for automobile use. These are entirely different machines from the present Dyneto and weigh but one-half as much. They are hexagon-shaped instruments, the smallest size weighing 30 pounds and being suited for cyclecar purposes; the intermediate one weighing 45 pounds and being for cars with 4¼-inch cylinders and under, and the large size weighing 55 pounds being suited for all sizes of cars, including four-cylinder and six-cylinder types. Mr. Doman, besides cutting the weight of these motor generators in half, claims to have as high motor pull, higher generating qualities, and with the ability to charge the battery at a slightly lower speed.

The Dyneto company is at present located in a four-story building with 30,000 square feet of floor space. Sixty men are employed at present, and it is expected to increase to 100 when the manufacture of its new motor generator is under way.

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Interested in Cost-Keeping

Manufacturers in various lines are showing increased interest in the subject of cost calculation. Following the successful work of the ribbon manufacturers in drawing up a cost calculation sheet and the advantages which have followed from its use, an association of ready-to-wear manufacturers and another in the knit goods line have undertaken similar projects. The obstacle that is encountered at the outset in such an undertaking is the difficulty experienced in convincing a manufacturer that, for the time and money he lays out, he will be paid back directly in dollars and cents.

Champions Efficiency and Simplicity of Air Cooling

The Automobile Engineers' Forum

Duryea Claims That a Fan on the Flywheel Will Cool Automobile Cylinders Perfectly Without Employment of Pumps, Radiators, Etc.—States That the Public Buys by Quantity

SAGINAW, MICH.—Editor THE AUTOMOBILE—Mr. Fraser's inquiry on page 1011 of THE AUTOMOBILE for May 13 as to why engineers do not give simplification of the motor some attention, particularly in regard to the method of cooling: I wish to answer by saying that successful air-cooled motors are running and have been running for many years. The problem is not to make the goods, but to make the public accept them. The public as yet is extremely ignorant of motor engineers' problems, and they buy not what they know personally to be the best, but what they see their neighbors buying, and so long as this is true, the old forms will predominate, while the improvements have a hard fight. The buyer judges by quantity, which he can see, rather than by quality because he cannot see it. He buys the big car, when a small one would serve him better, and the surprising thing is that the makers will continue to give the public large cars which they should not have, instead of small, simple, efficient, light-weight ones that serve them more perfectly. The phenomenal success of one exponent of the small, light-weight car surprises many people, but the surprise is not that its maker succeeded, but that several hundred makers of other cars sat still and let him take the business.

Automobile cylinders are kept small to make starting easy and to permit using a sufficient number to secure smooth running, so there is no occasion to get away from air-cooling; a fan attached to the flywheel will draw ample air to cool cylinders of the sizes used in automobile work, and there is no excuse for such complication as pumps and radiators, with leaky pipes, water to freeze, and similar troubles.—CHAS. E. DURYEA, Duryea Motor Co.

The Difference Between Carbureters, Mechanical Mixers and Vaporizers

NEW YORK CITY—Editor THE AUTOMOBILE:—When gas engines came into popular use about 15 years ago, any sort of mixing valve, with single air inlet and a spray nozzle, or a single jet nozzle, allowing the gasoline to flow into a passing stream of air, made a good carbureter or vaporizer. Because the gasoline in those days possessed high volatility and even at low atmospheric temperatures, gave good vaporized mixture to all cylinders of a gas engine, however badly designed the manifold, valve chambers, etc. These mixing valves, carbureters or vaporizers, were in fact measuring devices for proportioning air and liquid fuel oil, and because of the oil fuel's volatility by Nature, were vaporizers as well.

At the present time, the fuel oils are very complex in their variety of weights of hydrocarbons. For instance, what was known as Motor Spirit, a fuel oil which some oil companies tried to have used, had a specific gravity measurement of 64 degrees, and yet had boiling point of a portion of the hydrocarbons as high as 420 degrees Fahrenheit.

Gasoline is supposed to have a boiling point now of 104 to 180 degrees, but I have found 54-degree gasoline with boiling points higher than that mentioned for parts of so-called Motor Spirit.

American Fuel Output 15,000,000 Barrels

The oil companies cannot make as yet more than 10 to 15 per cent. of paraffin crude oils into commercial gasoline, say above 60 degrees specific gravity, and from 2 to 3 per cent. from crude asphaltic oils. This limits the possible production in America to perhaps 15,000,000 barrels of fuel oil for motor cars, not counting other forms of gas engines.

If you mix 64-degree gasoline one part and 48-degree kerosene two parts, you will have a mixture about 55 degrees specific gravity. This mixture, however, is not homogeneous as a liquid fuel. That is, the lighter portion, known as the gasoline, floats to the top of a receptacle while the kerosene portion falls below.

But if you make 54-degree gasoline straight at the oil works, while it may have exactly the same hydrocarbon contents as the mixture of gasoline and kerosene mentioned herein, yet it is a homogeneous mixture as a liquid.

If you attempt to use the present day mixing valves, carbureters, or anything aiming to measure the air and oil fuels, with present day oil fuels commercially available, only the slightest portion of the oil fuel is literally vaporized and that only at the instant of the opening of the throttle. After the throttle takes its position at any angle other than closed the oil fuels flow into the passing air column in liquid form, as drops, as threads, or flows along the walls of the manifold, etc. The lighter stuff is picked up gradually by the passing air column, but the heavier hydrocarbons go into the cylinders finally as liquids, or the very heavy stuff forms pools in manifolds, valve chambers, etc.

Heated Air Complicates Troubles

If you apply heated air to the carbureter you simply add to the carbureter troubles, because it is necessary with any carbureter alone, to use nozzles large enough to permit of flow of oil fuel when cold, and to permit of sufficient flow at low throttling speeds, when the air shock or partial vacuum are not sufficient to either break up the liquid into finely atomized form, or vaporize it.

When the hot air begins to warm up the carbureter and nozzles the flow of gasoline increases say from 60 degrees Fahrenheit as a unit basis, to twice the flow at about 140 degrees Fahrenheit and still faster if you apply more heat. This causes the mixture to become too rich at medium and high speeds, hence causes decreased power. Most engineers

seem to believe that mechanical mixers drop the volumetric efficiency when the real cause is too rich mixture. Hence, the necessity for auxiliary air valve carbureters for mechanical mixers or vaporizers.

Mechanical mixers, so-called, are designed to more finely atomize the liquid fuel, so that the partial vacuum, passing air column or heat applied to manifolds, or hot air to carbureter inlets may cause swifter evaporation. But the swifter evaporation, the greater the drop in temperature at the point where the mixers atomize the oil fuel finer than the carbureter action delivers it.

Heat Is Essential to Vaporization

To vaporize anything you must furnish heat, because the act of evaporation is a chilling process.

My new vaporizer, the upper portion of which applies heat of exhaust both to the internal and external cross-sections of a moving mixture column, vaporizes the very minutely atomized oil fuel broken into this condition by the swiftly revolving double heli coil, mounted in jewel ball bearings, fixed in the lower portion of the vaporizer.

The mixture delivered by carbureter outlet either in wet, vapor, partially atomized liquid in larger or smaller drops, and the liquid stream running along the walls of manifold, because of action of this mechanical mixer being that of a variable venturi tube, according to speed of engine, draws all liquids through the vortex set up within the agitator, and, owing to the swiftly revolving agitator, smashes the liquid, as a paddle would when driven into a glass of water thrown in the air, also breaks liquid as when drawn across a grated surface, also the agitator cheese-holes the air column because the revolving agitator constantly shifts the lines of its arc through the oncoming mixture column. All of these things together cause almost complete vaporization of the fuel oil and moisture in the air.

Cooling Brings Condensation

But after you create vapor in a manifold in a partial vacuum, with the air column moving at linear speeds of from 40 to 1,200 feet per second, according to type of engine and size and shape of manifolds, you add to the fall in temperature, and this causes condensation. No liquid oil burns in a cylinder of an engine as liquid. You must atomize, vaporize and then gasify it before the ignition flame fires the mixture.

You cannot heat the carbureter enough to prevent the chill of air expansion in any carburetion. No carbureter nozzle can make a spray fine enough on the road because of varying conditions to give constant vaporization, with or without heat in the carbureter. You must atomize the mixture after it passes the throttle. When you atomize it you again produce chill. Hence, my vaporizer action after the mechanical atomizer breaks up the liquid in the mixture as it comes from any carbureter at most of the speeds of engine at which 98 per cent. of the travel by the public takes place.

Hence, my atomizer's work follows the measurement of air and fuel in any carbureter. The vaporizer's work follows the mechanical atomizer's work. The mechanical atomizer alone gives greatly increased efficiency but in some cases simply reflects the good or bad adjustment of a carbureter. The vaporizer and atomizer together overcome the bad adjustment in most carbureters. Two jets and auxiliary air valve carbureters give fuel consumption efficiency at all speeds of gas engines. Single jet or single air inlet carbureters give with my vaporizer and mechanical atomizer combined the greatest possible efficiency say up to 20 miles per hour, but the mixture will be too rich above that speed. If you adjust the mixture flow above 20 miles per hour, in such types of carbureters, then you will have such a small nozzle opening at lower speeds, that the velocity of air going into the carbureter is not great enough to pull sufficient oil fuel through that small opening, because of capillary retardation in the small nozzle opening, prevents securing the minimum fuel oil necessary to hold power at low speeds, etc.

My vaporizer acts the same on a gas engine with its mixture fuel as a superheater does on a steam engine. There is this difference, however. A steam superheater adds but 10 or 11 per cent. to the normal wet steam efficiency from a fuel standpoint while my vaporizer with mixer combined has added over 200 per cent. to the normal fuel efficiency, when the carbureter in all cases was adjusted to give the maximum speed and maximum power at speeds below 20 miles per hour on the road tests.—W. P. DEPPÉ, manufacturer of the Stanley Gas Mixer.

Manifold Design Determines Efficiency or Abuse of a Carbureter

DETROIT, MICH.—Editor THE AUTOMOBILE:—We have not found any inconvenience deriving from the use of a waterjacketed manifold. The temperature of the water is not high enough to cause a prejudicable loss in the charge entering the cylinder. Whatever inconvenience there may be along that line, it is in most cases more than made up by the influence of the heated walls tending to prevent condensation, or loading, as it is usually called.

In many cases, the automobile engineer can do more than he is doing toward securing good carburetion. Carburetion begins at the float chamber and ends in the cylinder. The carbureter man is concerned with only a very small part of this.

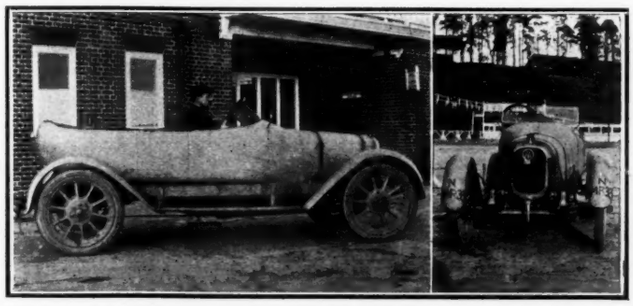
However, the views on manifold designs which we have held for some time and which are shared by a number of carbureter engineers, begin to be better understood as the demand for economy grows stronger.

To answer more specifically to your letter, we have always advocated that the manifold be heated, or that the air entering the carbureter be pre-heated, and sometimes we have advocated the use of both methods on the same engine.—V. R. HEFTLER, president, the Zenith Carburetor Co.

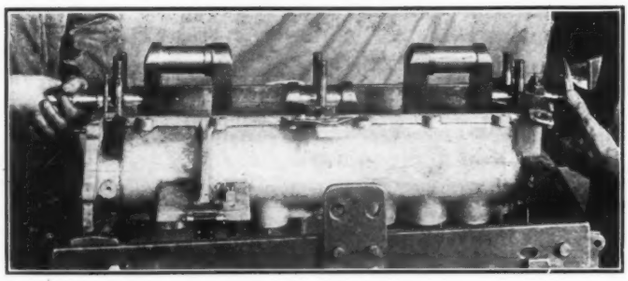
A Car That Came Up to Expectations

LONDON, ENG., May 12—The result of careful design is well illustrated in R. W. A. Brewer's 15.9 horsepower Belsize car that recently did 77 miles per hour on the Brooklands track, winning the Fourth 75 miles per hour Long Handicap, as the speed of the car was within .7 mile per hour of the calculated speed and the horsepower within .5, being 42 instead of 42.5.

The car is a sporting model equipped with a 3.15 by 5.91-inch motor and fitted with a four-seated streamline body, with windshield and fenders. The car is standard with the exception of special camshaft, cams and valves. The valve setting is peculiar inasmuch as the inlet valves are timed to close 60 degrees late.



Two views of 15.9-horsepower Belsize which developed within .7 mile per hour of the calculated speed and horsepower within .5 of the power calculated



The Rostrum

Many Favor Two Cycle—But Factories Are Wedded to Four

EDITOR THE AUTOMOBILE:—*I cannot help admiring Mr. Chas. E. Duryea for his courage in again coming to the defense of the much-maligned two-cycle motor. In his article in The Rostrum in your issue of May 7, he sets forth the vital defect of the four-cycle type and states conservatively some of the main points of advantage of the two-cycle. He is not alone in his position on this subject, and I fancy that, if the truth were known, some of the well-known engineers who are now bringing out four-cycle engines would be glad of the opportunity to turn their ability, aided by modern factory resources, to the designing and production of a two-cycle engine embodying in the highest degree the results of recent investigations in the field of gasoline engine efficiency. But the manufacturers wish it otherwise. They have educated the public to believe that the four-cycle engine is fundamentally superior to the two-cycle, and even if it were proven that this belief was incorrect it would not be to their financial interest to attempt to change the public opinion on this point.*

In Europe, the situation is somewhat different. There, scientifically designed two-cycle engines are being produced to a small extent which compare favorably with the four-cycle type, and the two-cycle problem is the subject of painstaking and thorough research. It is not unlikely that this may result in the production of an engine so far superior to the present standard four-cycle motor that it will sweep the field as the Knight engine has done, and we shall again witness the humiliating spectacle of the American manufacturers scrambling to get into line and bringing up the rear of the procession.

It seems to me that the broad-minded engineer, rising above four-cycle cant, must realize the crudity of a design in which, despite mechanical perfection, a piston and connecting-rod designed for pressures up to 500 lb. per sq. in. or more are employed half the time in pumping gases at approximately atmospheric pressure. Must we admit that it is impossible to design a practical automobile motor in which this dead revolution is eliminated and the good feature of the four-cycle type retained? From my own efforts to solve this problem, I am convinced that a successful solution is not beyond the range of possibility and that a fraction of the time and money that has been spent in the development of the four-cycle engine would produce very gratifying results.

This is a question, it seems to me, which should be of interest to many of the readers of THE AUTOMOBILE *and I trust that, the point having been raised, we may have further discussion of it.*

In conclusion, let me say that, in my opinion, the solution of the two-cycle problem lies in getting away from crankcase compression, if not from all precompression.

Chicago, Ill. A. S. HUSTED.

Questions on Non-Poppet Motors

Editor THE AUTOMOBILE:—1—If it takes less power to drive a rotary valve motor than a poppet valve motor, how is it that the former is not used?

2—How many single sleeve valve motors are there on the market as to your knowledge?

3—Are any of them operated by cams?

4—Will you kindly show by drawing and description the operation of some well-known single sleeve valve motor?

East Marion, L. I. WM. FURST.

—1—The rotary valve is used to some extent, probably the most notable example in this country being the Mead six-cylinder, made by the Speedwell Motor Car Co., Dayton, O.

The general proposition of what is best as exemplified in your question as to poppet and rotary valve motors can only be fairly decided by comparing all the advantages and disadvantages of each type and effecting a compromise that will give the best results considering all phases of the matter.

The matter of power consumption by the valve mechanism is not of as much importance as many other factors such as silence, reliability, wearing qualities, cost of manufacture, etc. Some of these features the rotary valve motor possesses to a greater degree than the poppet type and vice versa and the adoption of one type in preference to the other depends entirely on the relative weight of these considerations and on the carefulness of the motor design.

2—There are four makes. These are: The Argyll motor which is manufactured by Argylls, Ltd., Alexandria, Scotland, and which is installed in the Argyll car; the Magic motor, which was described in THE AUTOMOBILE for January 1, on page 74, the Charter, described Jan. 29, 1914, page 299, and the Rolland Pillian.

3—None of these motors use cams. One of the main reasons in using a non-poppet valve motor is to avoid cam-mechanisms with their attendant noise.

4—The Argyll motor is a good example of the single-sleeve type, and will, therefore be decribed. Fig. 1 shows a transverse section in which the sleeve S will be noted occupying the annular space between the piston and the cylinder wall. Its action is peculiar in that the motion imparted to it is not merely up and down but also partly rotational. This will be made clear by reference to Fig. 2 which shows the sleeve and its operating mechanism detached from the engine.

The reciprocation of the sleeve is effected by the action of a small crank C which has a sliding fit in the rotating member D. This latter is carried in in the bearing B, which is bolted to the crankcasing wall. The operating shaft A, which is equivalent and occupies the same position as the camshaft, is provided with four skew gears, one at each cylinder, which engage with teeth on the rotating member D, driving it at half the speed of the crankshaft. This reduction takes place at the skew gearing, the camshaft itself running at crankshaft speed being driven by a silent chain.

Two revolutions of the engine shaft, therefore, cause a single revolution of the actuating crank C, which in turn im-

parts such a motion to the sleeve that any one point on its outer surface will travel through an elliptical path on the cylinder wall.

This peculiar motion is the fundamental principle of the Argyll valve. It permits a complete registration of the port P with the corresponding ports in the cylinder wall while the sleeve is traveling in one direction and a complete closing on the opposite stroke. As the valve descends the exhaust is opened and during the return stroke the inlet ports open. This cannot be accomplished by a single up and downstroke of a sleeve with the ordinary straight reciprocating motion, where both valves would necessarily be open twice.

Worn Bushing Makes Gear Slip Out

Editor THE AUTOMOBILE:—I have a Hudson model 20 which always slips out of high speed when going over a bump or running down hill.

I have put in new gears and put a spring in to hold lever in place, which does not change conditions. Please advise me what else you think I might try.

Milwaukee, Wis. ROBERT GEBHARDT.

The slipping out of high gear may be caused by the bushing that carries the forward end of the main shaft being loose or the locking mechanism may be worn.

It sometimes happens that the dowel pins holding this bushing shear off and allow it to rotate with the shaft. This wears the hole in which the bushing is set and also wears the flange on the rear end of the bushing so that the main shaft may have as much as .25-inch end play in it. Since direct drive is obtained by engaging an internal-external gear pair and since the movement to mesh them is only .25-inch, the play that sometimes develops due to the wearing of this bushing in the manner described is sufficient to prevent the proper engagement of the direct drive members with the result that when the car is driving the motor as when traveling down hill or, momentarily when a bump is encountered, the gears slip out of engagement and if the play is very, very great it will be impossible to engage high gear at all.

Another possibility is that the locking mechanism is at fault. The various gears are locked in position by means of balls engaging circumferential grooves cut in the shifting rods. The balls are forced into the grooves by springs. After a machine has been used a great deal these balls may wear longitudinal grooves in the shifting rods with the result that the locking effect is reduced. If this is the case a new surface should be obtained by removing the shifting rod and rotating it through 180 degrees. This repair calls for some skill and should be left to the repairman unless you feel thoroughly competent.

Why Magneto Generates 12,000 Volts

Editor THE AUTOMOBILE:—1—Will you please explain how it is possible for a magneto to furnish 12,000 volts?

2—If 12,000 volts are produced at the spark gap why does a shock not prove fatal?

3—How do you find the volts produced at the spark gap?

Inman, S. C. SUBSCRIBER.

—1—The magneto does not directly generate this voltage but it produces a voltage that varies from about 6 volts up depending on the speed of the motor, the size of the gap at the spark plugs, etc. This low-voltage current is transformed into one of high voltage, varying from 9,000 to 12,000, by means of an induction coil which may either be placed on the armature of the magneto or be a separate unit. The induction coil is merely two independent windings, one of which consists of a few turns of comparatively coarse wire and the other a great many turns of fine wire, the former is known as the primary, low-tension or low-voltage winding and the latter the secondary, high- tension or high-voltage winding. The voltage generated in the secondary compared to that in the primary is roughly proportional to the ratio of the number of turns of these two windings. Therefore by making this ratio the proper amount a voltage of 9,000, 12,000 or even higher may be obtained. In a high-tension magneto the induction coil is wound on the armature, the low-tension winding being used for the generation of the current.

2—The reason that this voltage is not fatal is because the quantity of current or amperage is extremely small.

3—The only practical method of measuring these voltages is by means of the Oscilligraph, an ordinary voltmeter being out of the question because of the rapid fluctuations in voltage. The Oscilligraph is an extremely delicate voltmeter in which the wave of high-voltage current is passed through a delicately suspended coil of small size that is placed between the poles of a magnet, one of the horse shoe type being satisfactory for this purpose.

When the current flows through this coil, the magnetic field set up around the coil acts on the field of the horseshoe magnet, the result being that a turning force is exerted on the coil, the exact degree of this force depending on the strength of the current that is flowing in the coil which in turn depends directly on the amount of voltage.

Attached to this coil, is a small mirror which reflects a pencil or beam of light on to a ground glass screen. When the spark occurs at the plug the rush of current causes a movement of this ray of light that is proportional to the voltage, and since this movement is too rapid for the eye to follow a camera is placed on the other side of the screen and the amplitude of the movement of the light ray is photographed. By calibrating the instrument the amplitude of the movement represents a certain number of volts.

Overheating Caused by Wrong Timing

Editor THE AUTOMOBILE:—Why does the water boil so readily in my model T Ford? I use the best, light, high-grade oil. The combustion chamber and spark plugs are clean. The water circulates and the fan works perfectly. The clutch is in good condition. I run on as lean a mixture of gasoline as possible and advance the spark as far as I can without the engine knocking. I am using a master vibrator and electric lights from the magneto.

The engine works perfectly until it gets too hot, which occurs after about 10 minutes running. The water boils vio-

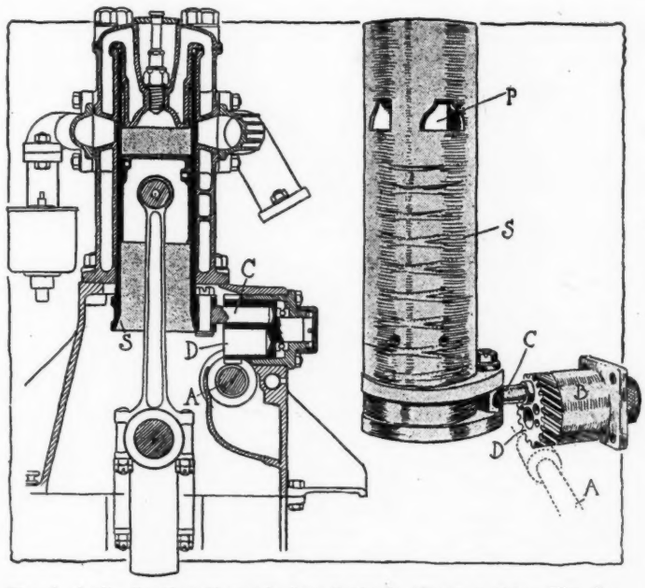


Fig. 1—Left—Section through Argyll single-sleeve motor. Fig. 2—Right—Sleeve and driving mechanism

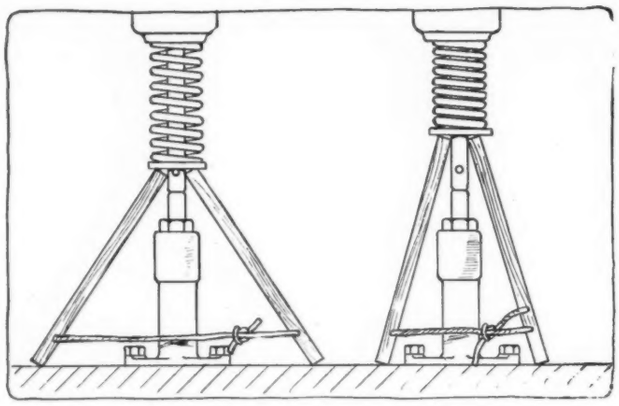


Fig. 3—Simple scheme for removing valves

lently then. I have had the car gone over at a very good garage without their finding anything wrong. Can you suggest a cause of the trouble?

Creeds, Va. N. A. NICHOLSON.

—Under the conditions you have laid down the only possibility is incorrect valve timing and it would be well to remove the timing gear housing and note whether the gears are set properly. There is a mark O on both the crankshaft and camshaft gear and these two should be set together.

If the trouble is not found here, it must be that you have made an error in describing the symptoms. Make certain that the water is circulating freely both in the radiator and in the water jackets. This can most easily be tested by flushing with a hose. Grease and dirt in the cooling system can be removed by using a saturated solution of sodium carbonate in water.

When driving along the level it should be possible to advance the spark nearly all the way without the motor knocking providing that the carbureter is properly adjusted. It would be advisable to set the carbureter so that the motor develops full power rather than make the mixture as weak as possible. This should not cause the motor to overheat.

See that the fan belt is not loose. It may be tight enough to operate the fan without slipping when the motor is idling, but yet slip when the motor is speeded up.

Safety Spark Gap Protects Insulation

Editor THE AUTOMOBILE:—In your reply to W. J. Gano's letter on page 825 of THE AUTOMOBILE for April 16, it is stated that, if the wire is not grounded, the current passes through the safety spark gap on the magneto.

There are, however, some magnetos which have no safety spark gap and I would appreciate advice from you as to what would happen under the conditions mentioned in Mr. Gano's letter without a safety spark gap on the magneto, assuming that the wire is removed from the plug and left hanging in space.

The condition prompting my inquiry arose in the case of a friend's car, with which we had considerable trouble and after eliminating troubles in the carbureter we still found that the engine would miss irregularly and that a small spark would show from the housing of the coil to the metal frame of the dash on holding a screw-driver across. On examining the magneto I found that there was no safety spark gap provided and came to the conclusion that the use of the spark plug pump was the cause of the trouble. After having the coil changed for a new one we found the engine worked well and I suggested when removing the spark plug it would be necessary to reconnect the high-tension wire to the terminal of the plug and lay the latter on the engine so that it would pass the spark in the ordinary way.

New York City. R. A. ARNOTT.

—Every magneto system should have a safety spark gap somewhere in the high-tension circuit, and if the instrument generates a low-tension current which is stepped up in an exterior coil the gap may be on the coil instead of on the magneto. If there is no gap on the magneto then it should be seen to it that there is one on the coil.

When a high-tension wire is disconnected from the spark plug and left hanging in the air, there is danger of the excessive voltage generated under this condition puncturing the insulation of the high-tension coil. The theory involved in explaining clearly the reasons why an extremely high voltage should be produced when this is done is long and complicated but it may be said that this high voltage is due to two conditions. In the first place the voltage when current is not flowing is much higher than when it is flowing—as is the case when the spark jumps across either the plug or the safety gap. In other words the no-load voltage generated in the high-tension coil is considerably higher than voltage under normal load. Secondly this already high voltage is augmented by a condenser action in the coil itself.

Thinks Sooting of Cylinder Due to Rings

Editor THE AUTOMOBILE:—Referring to a letter in The Rostrum of May 14, signed R. A. S., Garden City, N. Y., I have had an identical experience with a Reo, the third cylinder getting too much oil. I tried dressing down the scoop in the connecting-rod, adjusting the flow from pump, but without avail. Finally I corrected the trouble entirely by putting in three new rings. This may help his car.

Pierson, Ia. G. P. MCGRAW.

A Simple Spring Lifting Device

Editor THE AUTOMOBILE:—There are spring lifters galore, and on the manufactured types I can offer no improvement because they are about as good as can be made, but in Fig. 3 is a little scheme, however, that works out nicely in a pinch and where nothing more is required than a couple of pieces of wood and a hook or cord.

Cut lengths of wood to fit under the valve-spring seat as shown and then with the valve fully opened put them in place. Turn the motor over and the push rod will slip down, following the contour of the cam. The valve can then be pushed down so that the pin holding the seat is exposed and can then be removed. Sometimes the engine design is such that friction alone will hold the wooden pieces in place, but where they are liable to slip they can be tied in place. By slipping this cord down, as you will readily observe, a holding fit will be effected.

New York, N. Y. W. F. SCHAPHORST.

Number Three Cylinder Sooting Caused by Thrust

Editor THE AUTOMOBILE:—I wish to take exception to your advice in the May 14 issue of THE AUTOMOBILE under the title of Connecting-Rod Scoop Too Long.

Mr. R. A. S., of Garden City, N. Y., notes that the scoop in question only dips about 1-32 inch at present. His own theory seems very reasonable to me. In support of his theory it should be noted that two cylinders occasionally soot up while number three is the chronic offender.

His idea that more than half of the oil to the center bearing may flow into the basin under number three crank is an experimental fact with most motors. This is commonly due to the thrust developed by the helical timing gear on the crankshaft, causing nearly all clearance to be on one side of the center bearing. If the timing gears are spur it is very possible that there is a thrust existing from some other cause. The greater part of the oil, of course, flows from the side having the greater clearance and is thrown by the arm of the crank up into that cylinder.

As you say denting the oil pipe to the center bearing would not help the trouble, and is besides a poor expedient.

Mr. R. A. S. might try putting a choke washer of the proper size in the oil pipe, or better yet, restore the center bearing to its original condition prior to the 7,000 miles he has run his car.

Cleveland, O. G. W. SMITH, JR.

Car Traveling 20 m. p. h. Stops in 28 Feet

Editor THE AUTOMOBILE:—Kindly let me know what distance should be required to stop a 4,000-pound car going at the rate of 16, 18 and 20 miles per hour? I have seen tables in THE AUTOMOBILE showing the distance required to stop the cars during various contests.

A MAN INTERESTED IN BRAKES.

Newton Highlands, Mass.

—The tables you probably refer to are those that appeared in the December 4, 1913, issue of THE AUTOMOBILE on page 1082, and in the December 11, 1913, issue on pages 1092 and 1094. These tables were the results of tests performed at the end of the New York 500-mile reliability run and the data thus obtained was considered in awarding the prize to the winner.

The results of these tests are fully tabulated below for the reason that there were only two cars tested, numbers 5 and 6, that weighed in the neighborhood of 4,000 pounds. A consideration of the results as a whole will probably enable you to obtain a better idea of how quickly the average 4,000 pound car is capable of stopping than by merely considering the two mentioned.

	Car	Weight with Passengers	Speed	Distance Required to stop Hand	Foot
1	Buick	3,020	16	37	38
2	Buick	3,080	16	33.5	30
3	Buick	2,680	16	29.5	26.5
4	Buick	3,280	16	23.5	24
5	Chandler	3,810	18	28	35
6	Oakland	4,350	18	28	37
7	Oldsmobile	5,230	20	45	121
8	De Dion	5,100	20	41.5	32.5
9	National	4,900	20	58	30
10	Hudson	4,970	20	44.5	46
11	Buick	4,658	20	34	29

A Small Car Body Design

Editor THE AUTOMOBILE:—In Fig. 4 is a design for a light car that I believe has superior body lines and is an improvement on most of the small machines now on the market. The mechanical construction is conventional throughout, the tread is standard and the car is to weigh not more than 800 pounds.

It is a special underhung design and the cushions are to rest in pits, so as to prevent the occupants from sitting too high and appearing awkward, as in some small cars that are on the market.

Bloomfield, Conn. WM. L. DOUGLAS.

Compression Lost Around Valve Housings

Editor THE AUTOMOBILE:—Recently I had an experience with a car which had not been run to exceed 2,000 miles that illustrates what an insignificant trouble may cause the condemnation of a good machine. The purchaser sold the car in disgust after paying the owner of the garage about $300 for repairs without any apparent improvement in the operation of the machine. They recommended a new carbureter, a new magneto and condemned the car in general.

On investigation the writer found the engine in fine condition but with no compression in two of the cylinders and poor compression in the other two. The engine was disassembled for further examination and the piston rings and valves were both in good shape.

The valves were all located in the cylinder heads in removable valve cages which were fitted into the cylinder with a ground joint at their lower extremity and held firmly in place by two studs through wings in their upper part. The loss of compression was not in the valves or the piston rings but between the valve cage and the cylinder. The repair men had tightened one of the studs holding the valve cage as much as possible before tightening the other, causing the valve cage to seat improperly with a great loss of compression.

With this small but important correction the engine worked beautifully and has given excellent satisfaction ever since.

New York City. H. F. B.

Water in Gasoline Causes Misfiring

Editor THE AUTOMOBILE:—I have been having trouble with my car and I suspect it may be water in the gasoline. Will you kindly inform me what the symptoms are when this is the case.

Nothing is wrong with the car that can be discovered.

Mansfield, Mass. S. F. FRENCH.

—Water in the gasoline has an effect similar to dirt, the exact symptoms being dependent on the amount. If an occasional drop is sucked through the spray nozzle, the motor will backfire or miss depending on what proportion of fuel it prevents from flowing through.

If the float chamber through any accident should become full of water it would be impossible to start the motor.

The remedy in any case is to drain the float chamber of the carbureter. In order that you may not have this trouble again the proper precautions should be taken. Be careful that no water is introduced either into the fuel tank or the carbureter when the car is being washed. Furthermore it would be advisable to install a gasoline separator between the tank and the carbureter. This device will catch all water, and dirt as well, and is certainly well worth the expense.

Burning Carbon with Oxygen Not Harmful

Editor THE AUTOMOBILE:—1—Does the heat generated by oxidation affect the cylinder walls or piston head?

2—Should some solution be used after burning in order to wash out any silica or non-volatile oxides which may be left?

Madison, Wis. F. B. MOSHER.

—1—The heat generated by the oxidizing or the burning of the carbon is not sufficient to harm the cylinders. The spark plugs should be removed though as they are harmed by the heat.

2—There is no reason for using a fluid to wash out the cylinders after the carbon is burned out. In the first place the only material left over is a small amount of silica and in the second place this is blown out with the exhaust as soon as the motor is started.

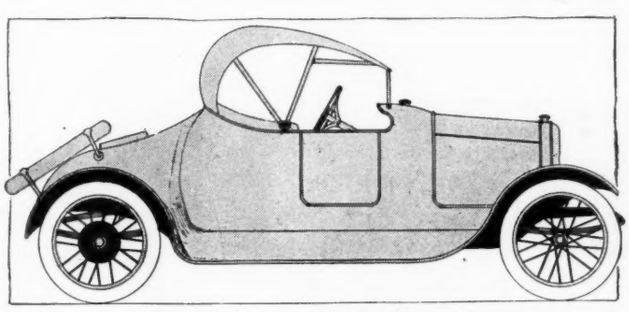
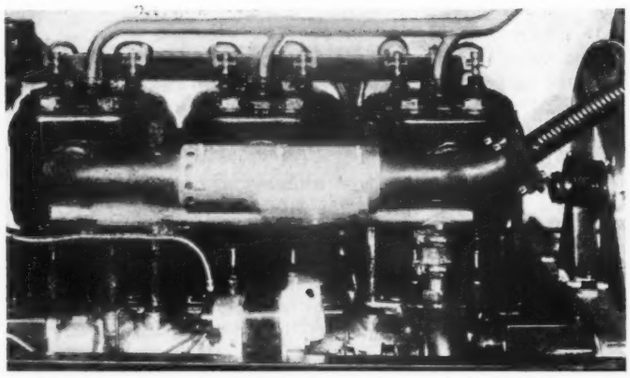
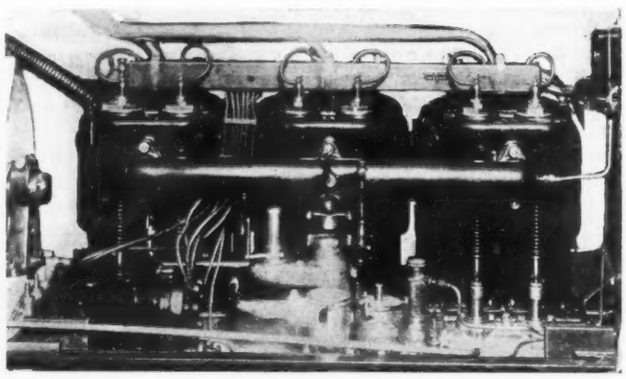


Fig. 4—Light car designed by reader





Left—Right side of six-cylinder Locomobile motor, showing mounting of Westinghouse lighting generator on pumpshaft. Right—Left side of six-cylinder Locomobile motor, showing location of Bosch magneto and carbureter

Locomobile Drops Right Drive Models

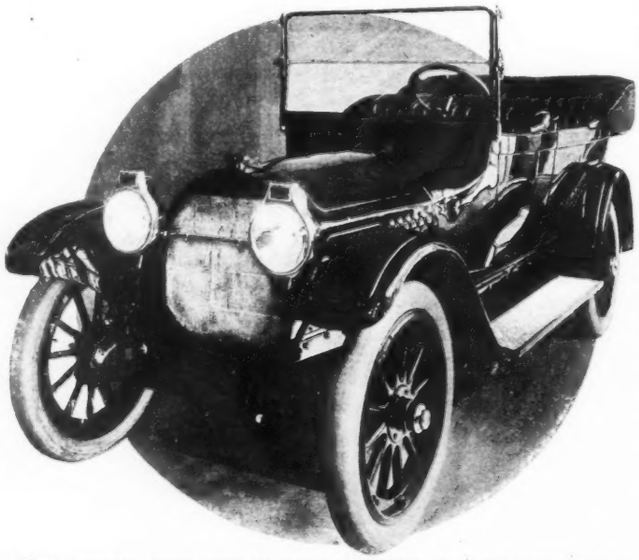
Continues Two Sixes—Adopts Westinghouse Starter—Drop Forgings for Small Parts—Luxurious Body Design and Equipment

TWO sixes comprise the Locombile line for 1915. They are continuations of the 38 L D and 48 L D of last year with refinements which are principally found in the body and equipment. The 38 R D and 48 R D of last year have been discontinued and only left drive cars will be made. The initials R D signified right drive.

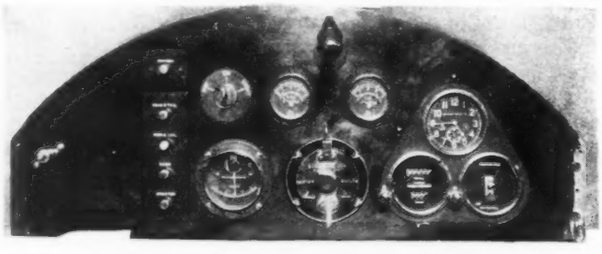
Westinghouse System

The adoption of the single wiring Westinghouse electric lighting and starting system with a special control apparatus designed by the Locomobile engineers is the chief refinement to be found for the coming season. With this control, starting has been reduced to the pressing of a button and the shifting of the starting gear is accomplished electrically through a solenoid instead of manually. All the electrical push buttons are now placed in a vertical row on the instrument board and the starter button being placed at the bottom can be operated by the foot. The other refinements include the use of drop forgings for many of the small parts, such as windshield bracket, bonnet clips, throttle levers, etc. The top is provided with a lining concealing the bows, and in the interior work the decorative scheme has been considerably improved. The fenders are more heavily crowned than last year and are made in one piece, the brakes are 2 inches larger in diameter and the tread has been widened to the standard 56, instead of 54.5.

The two motors for the 38 and 48, known respectively as the Little Six and Bix Six, are exactly similar in design. In fact, they do not depart much from Locomobile practice of the last two years, except that when this company changed to left drive last year, the alterations necessary in putting the steering column on the other side of the motor had to be made. Both motors have T-cast cylinders in groups of two with integral waterjackets, except for the waterjacket caps, which are separate. The motor sizes are respectively 4.25 by 5 and 4.5 by 5 5, giving S. A. E. ratings of 43 35 and 48.6. The makers claim an actual horsepower output of 63 and 82 at a crankshaft speed of 1,800 revolutions per minute on the dynamometer.



Three-quarter front view of new Locomobile six. Note novel lamp design, doing away with side lights



Arrangement of Locomobile dash on the 1915 models

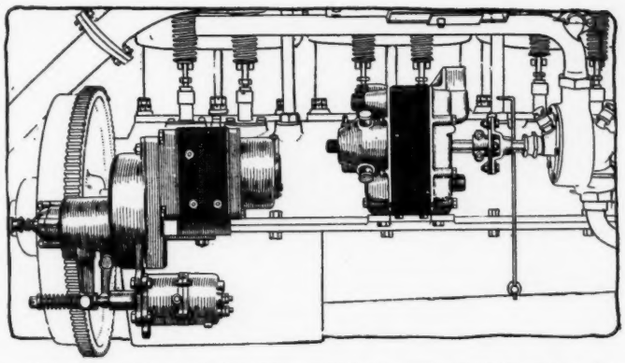
Seven-Bearing Crankshafts

The wristpins are 2 13-16 inches from the tops of the pistons, and they are composed of case - hardened, chrome - nickel steel fitted with a bronze bushing to take the upper connecting-rod bearing. The connecting rods are I-beam sections and are 11 inches in length for the Little Six and 12 inches for the Big Six. They are of chrome-nickel steel and on both motors have a big end bearing 2 inches in length. Both have seven - bearing

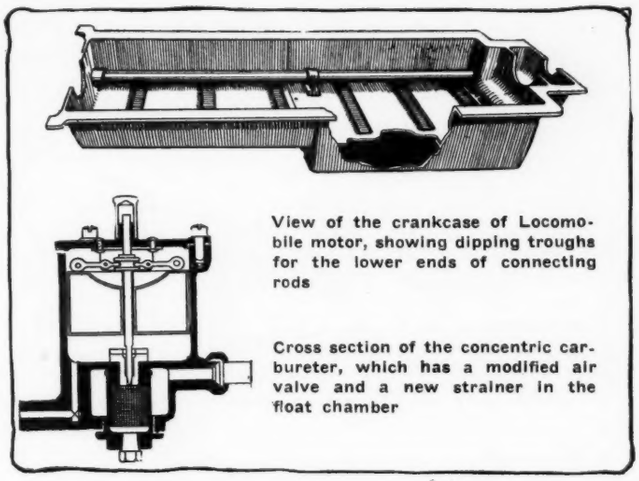
crankshafts with the bearings between the cylinder castings longer than the alternate bearings.

The timing gears are of spiral design and the camshaft has the cams integral and acting directly on roller followers. The pushrods are carried in exceptionally long guides as will be noted in the part sectional illustration. The cold clearance between the bottom of the valve stem and the pushrod is 0.004 inch. The spiral gears are ground to a limit of 0.00025 inch.

The cooling system is operated by centrifugal pump located on the forward end of the motor. The radiator is a honeycomb and is larger than last year, to fit the streamlines. It rests in a steel cradle on rubber bumpers. The fan is of aluminum with six blades. It is mounted on a bracket fixed to the timing gear case. The electrical system comprises a Westinghouse single-wire equipment for starting and lighting and a high-tension Bosch dual system for ignition. This provides a three-unit electrical equipment, as the starting motor and electric generator are separate. The starting motor is a series-wound type and has a gear on the end of the armature shaft which meshes with the flywheel gear as soon as the starting control button on the dash is pressed. This is accomplished by a solenoid, which is in operation as long as the button is depressed. The generator is a differentially wound machine having four poles. Without the lamp load, it has a normal output of from 12 to 14 amperes at 13 miles an hour. It picks up the load at 9 miles an hour and can carry at 15 miles an hour the entire set of lamps. The armature windings are baked into position with Bakelite.



Mounting of the Westinghouse electric starting motor on the flywheel of the Locomobile Six and the electric lighting generator on the pumpshaft



View of the crankcase of Locomobile motor, showing dipping troughs for the lower ends of connecting rods

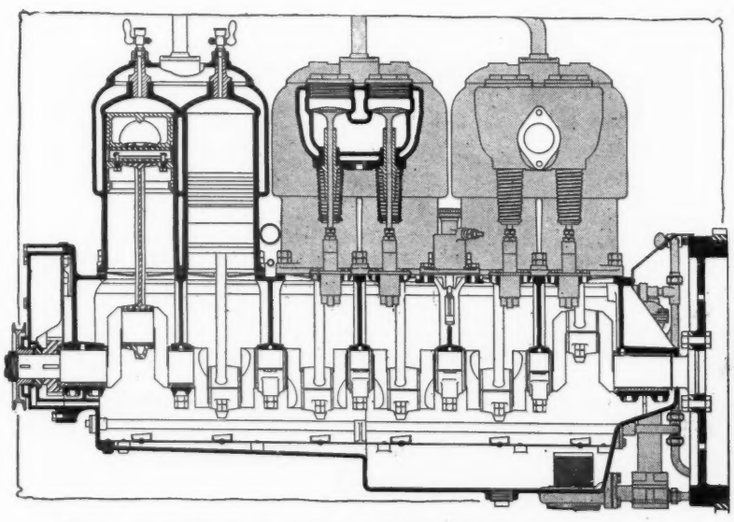
Cross section of the concentric carbureter, which has a modified air valve and a new strainer in the float chamber

Aluminum Windings in Generator Field

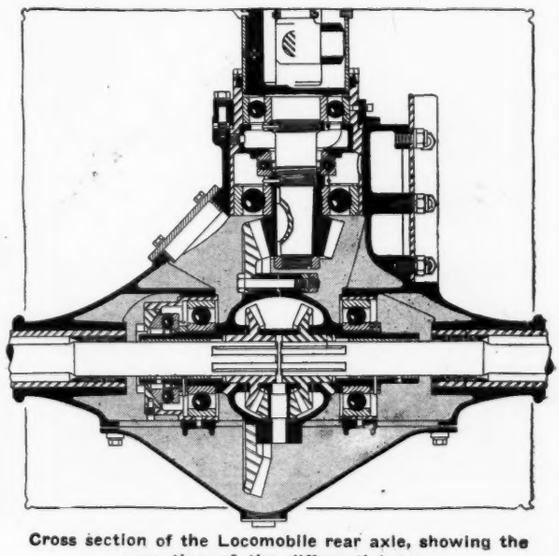
The generator field windings are aluminum wire, which is used because of the property of aluminum for increasing or decreasing its resistance in proportion to the heat or cold. In cold weather the resistance of the field windings is low and the output consequently high when most needed. The cowl panel is wired as a unit and can be removed from the car by disconnecting the main leads from the chassis. The lock switch shows three positions, on day and night. It can be locked in any one of the three positions by the same key, which operates the bonnet lock, tool boxes and tires.

The lubrication system is self-contained within the motor and is operated by low-pressure gear pump. The leads are carried to all the motor bearings, providing an equal distribution of the lubrication. A new feature of the lubricating system is a compartment in the oil pan, which is covered by a plate in such a manner that the oil is held in the rear part of the motor when the car is descending a hill. This prevents flooding the front cylinders at this time.

The carbureter adopted last year is continued with a small alteration in the air valve and with a new strainer in the float chamber. The alteration of the air valve consists in the adjustment of both springs from the steering column, whereas last year only one spring was affected by the steering column control. The carbureter is fed from a 28-gallon tank at the rear of the car by pressure. This year the tires are 37 by 5 on all the heavy models.



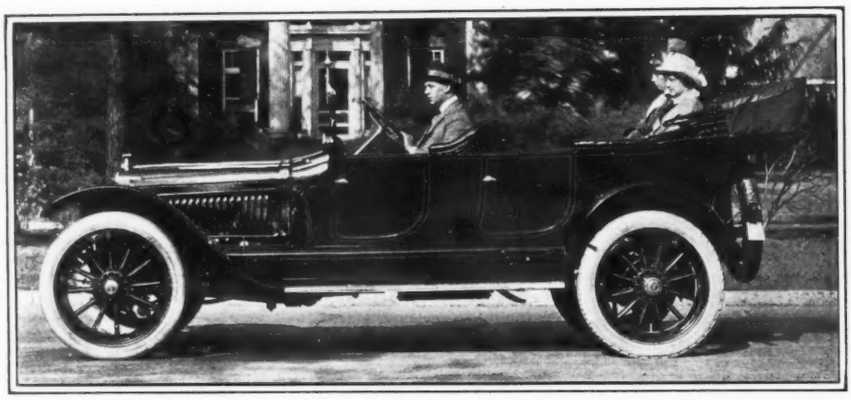
View and longitudinal section of Locomobile motor, showing the large-area valves and seven-bearing crankshaft



Cross section of the Locomobile rear axle, showing the mounting of the differential gear

New Lozier Light Six Has Longer Stroke

Motor Develops 65 Horsepower— Wheelbase Is 4.5 Inches Longer Than on Previous Model— Round-Nosed Radiator

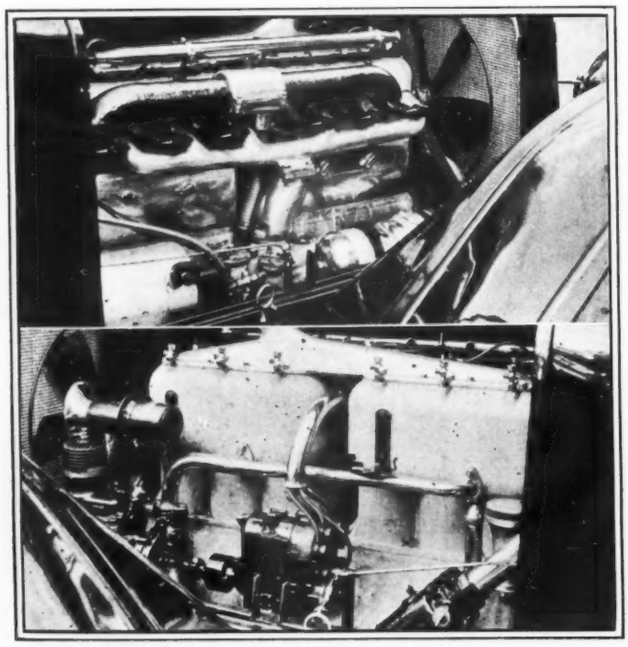


Side view of the new Lozier light six, which is the largest capacity car ever built by the company. It sells for $3,250

A LIGHT six Lozier of a new series has made its appearance. It is the largest car the Lozier company has ever built in point of wheelbase and carrying capacity, and its motor has a .5-inch longer stroke than that of last year's light six, although the bore remains the same. The price remains the same at $3,250.

The new Lozier's engine has a bore of 3.875 inches and a stroke of 6 inches, and, except for a few minor changes remains the same in design as its predecessor. The cylinders are L-head type, cast three in a block, and the horsepower developed is about 65. The motor of the previous series showed about 50 horsepower with the 5.5-inch stroke, which is an evidence of what the increase in stroke length means in power developed.

The designing hand of J. G. Perrin, the Lozier company's engineer, is in evidence on this newest creation of the concern's shops and is reflected in the neat arrangement of the various units. The valves are all on the right and valve mechanisms are completely inclosed against dust and to prevent noise. The valve lifters are of the rocker form, and this tends to a quieter operation than with the usual straight type, it is believed. To promote a truer valve seating, the springs are of the taper form and at the same time prevent uneven wear.



Upper—Right side of the new Lozier light six motor, which has a bore of 3.875 inches and a stroke of 6 and develops 65 horsepower. Lower—Left side of motor, showing clean-cut design

No Change in General Design

As to the working parts, these have required no change in general design. There are three main bearings for the crankshaft and an equal number supporting the camshaft. The pistons are each fitted with four rings, three above the wristpins and one below, the lower acting as an oil ring to prevent the lubricant from working up into the combustion chambers. Oil grooves are also cut in the faces of the pistons to aid in the even distribution of the oil.

Lubrication is of the conventional combination force-feed and splash type. A gear-driven oil pump located in the engine base forces the oil from the sump to the main crankshaft bearings, the main lead from this pump passing to a dash gauge and thence back to the point of circulation. This main passage also has leads running from it to the bearings, the surplus flowing back into the crankcase into the individual troughs under each of the connecting-rods. There is a small dipper on the end of each rod which scoops up the oil and sends it up into the cylinder and piston bearings. Leads also carry the lubricant to the camshaft bearings, the timing gears and magneto and pump gears.

Gray & Davis System Used

The Bosch high-tension magneto is retained for ignition, being on the side opposite to the valves and driven from the end of the centrifugal water pump shaft. The Gray & Davis cranking and lighting system is also retained, and is, of course, entirely independent of the ignition. There are separate units for generation of the current and for starting the engine. They are both located on the right side of the engine. The generator is placed just back of the fan driving pulley and is driven from the rear end of the fan driving shaft. The cranking motor pinion meshes with teeth cut in the periphery of the flywheel. At ordinary driving speeds of about 15 miles an hour, the generator charges at the rate of 12 amperes. The storage battery is of 120 ampere-hour capacity and is of the 6-volt type.

The usual method of starting is employed. A conveniently located pedal, when pressed down part way, sends a small amount of current to the motor, turns its pinion slow-

ly and at the same time draws it into mesh with the teeth in the rim of the flywheel. When the pedal is now pressed all the way down, the full current goes to the motor, and it then turns the engine at about 100 revolutions a minute.

Drive Is Taken Through Rear Springs

The gearset which is in unit with the engine is arranged for center control and gives the usual three speeds ahead. The drive is taken through the rear springs, which is a factor for lightening the construction. This is a change from the previous light six, which had a torsion tube inclosing the driveshaft. The new construction entirely eliminates this tube as well as any other side torque arm. There are two universal joints on the shaft, and in order to take the drive, the rear springs had to be slightly increased in size.

The rear axle is a floating type and is mounted on ball bearings throughout. The platform rear spring suspension, which has always been a distinguishing Lozier feature, is retained and consists of a rear cross spring shackled at its center, and fastening at its ends also through shackles to the rear ends of two side springs, which attach at their front ends to the side members of the frame. These springs are outside the frame. Standard half-elliptic construction obtains for the front springs.

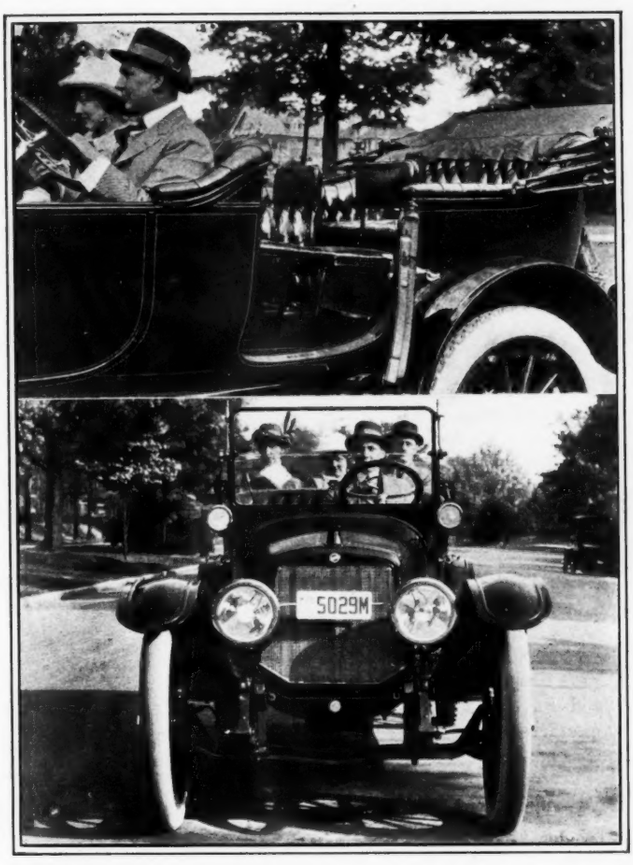
Other chassis features are: multiple disk clutch, left drive and center control, artillery wheels carrying 36 by 4.5-inch tires, 16-inch brakes, internal and external expanding, and standard tread.

The lengthening of the wheelbase is 4.5 inches, making 132 inches. This was done in order to provide room for the new convertible five and seven-passenger body with vanishing type extra seats. When not in use, these extra seats fold into the backs of the front seats where they are out of the way of the passengers.

Twenty-three-inch doors front and rear with concealed hinges are featured in the new six. They improve the appearance of the car noticeably and provide more room for the passengers getting in or out of the car. In fact, commodiousness has been the keynote in designing the body. It is noticeably larger, both inside and outside. The preceding model provided room for five passengers only, while the new body takes care of two more readily.

Round-Nosed Radiator

One new feature which impresses the average observer at once is a round nosed radiator, which gives a very pleasing head-on view, although it does not change the standard Lozier radiator form. It is really a coping-over of the edges of the cooling apparatus, and is simply an added refinement.

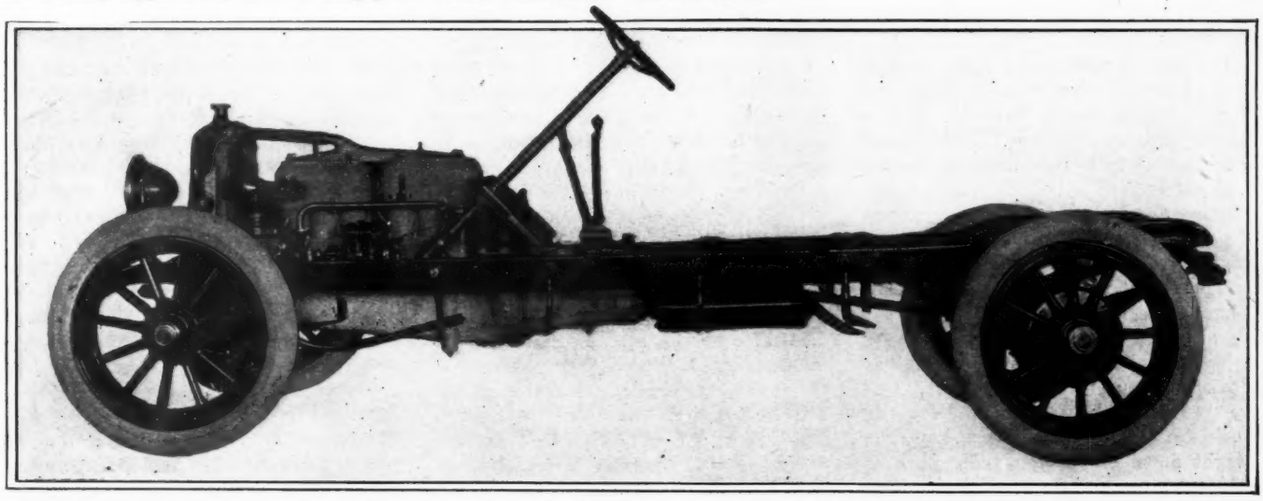


Upper—View illustrating 23-inch doors on the new Lozier light six, as well as the folding seats in the tonneau. Lower—Front view of the Lozier light six, showing the new round-nosed radiator

The instrument board has also been moved up to the top of the cowl where it is at the driver's finger tips.

The new six weighs under 4,000 pounds, which is rather a tribute to its designers inasmuch as its wheelbase is considerably longer than its predecesor's and even with this added the weight is only 85 pounds greater.

The equipment is complete in every detail and includes such apparatus as a specially designed tire pump, engine driven, inclosed speedometer drive, one-man top, easily operated rain-vision, ventilating windshield, robe and foot rests, headlight dimmers, and rebound absorbers, trunk rack, side curtains.



Left side elevation of the new Lozier light six chassis, showing round-nosed radiator, drive through rear springs, mounting of control levers, etc.

Valves-in-Head Predominate at Speedway

(*Continued from page* 1109)

same as last year except that the bore has been increased slightly and the stroke lessened a little. The old Mercedes chassis is practically the same as always, being one of the few with chain drive and having 108-inch wheelbase.

Mercedes Uses Steel Cylinders

DePalma's new six-cylinder Mercedes is one of the speediest looking cars in the race. It has a long pointed nose and pointed radiator, the hood being shaped somewhat like the hull of a speed boat, with a reverse curve to throw the wind out. The radiator is hung on trunnions and there is a screen in front. The cylinders are cast in pairs and the valves are overhead. The car is chain driven and a spout is provided from the oil system which shoots oil on each chain at the front sprocket. The pistons are of cast iron, but the cylinders are of steel and a block of two cylinders weighs just 22 pounds.

Rayfield Extreme Stream Lines

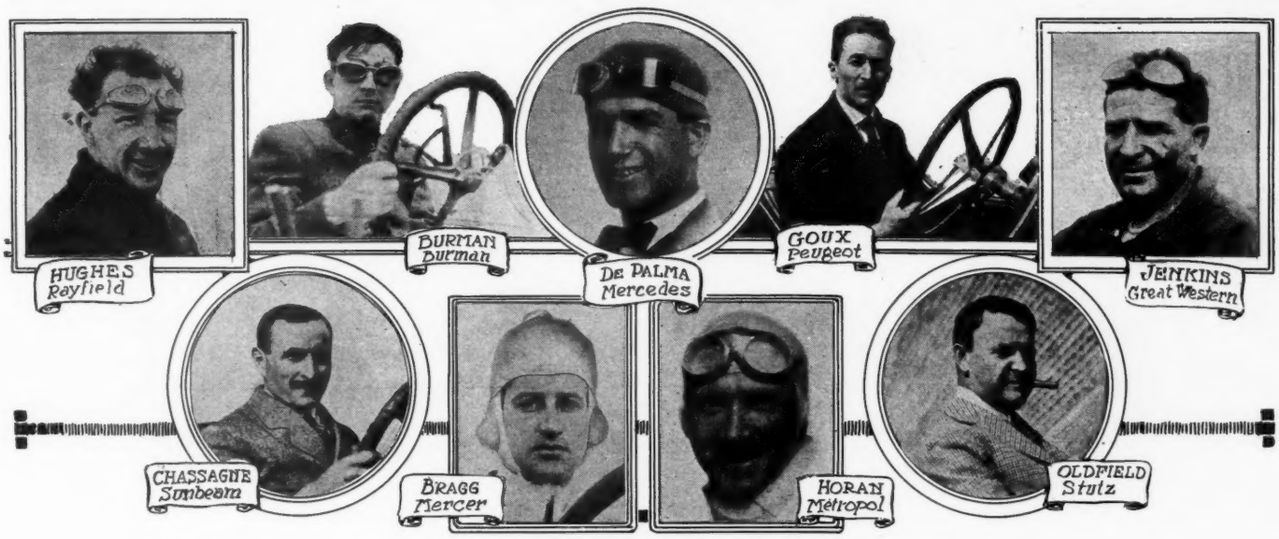
The car in which the streamline is carried out to the greatest extent is Hughie Hughes's new Rayfield. This is the design of William Rayfield and Hughes and will make its first appearance at Indianapolis. The motor was built by the Rayfield Motor Co., and is of six cylinders 5.135 by 5.5. The valves are placed so close to the bore of the cylinders that though the cylinders are L-head type the type is practically the same as the overhead system, as there are practically no pockets and the explosion is concentrated above the pistons. Hughes has aimed to keep the whole car very light and has kept the weight down to 1,950 pounds.

In carrying out the streamline effect, in order to do away with the usual

banking of the air against the dash board when it comes through the radiator in front, two radiators have been placed on the side of the car just in front of the dash and extending out from it allowing the same amount of cooling surface on each side of the car as there ordinarily is in a front radiator. This permits a very narrow body and at the same time allows the hood of the car to come to a point, so that the air goes through the cooler and passes on without banking against any part of the car. Two magnetos are used, both on the same longitudinal shaft, one alongside the engine and the other behind the rear engine support. There are two sets of plugs, one set leaning vertical over the exhaust side and the other inclined at about 45 degrees on the carbureter side. The carbureter is attached directly to a water-jacketed manifold on the opposite side from the valves so that the gas is well heated. The streamline idea has been so well carried out that the exhaust gas which is led back to the rear through a pipe which ends about two feet to the left of the tail, is drawn toward the point of the tail, and when the car is moving there appears that the exhaust comes out of the latter. In fact, all the dust in the back of the car instead of curling outward and upward as usual converges at a point some 50 yards in the rear of the car. One of the features of the car is that the drive and torque is taken through the springs alone. These are very flat and end on a cross tube which extends clear across the car. The engine has ball bearings throughout and is hung on two tubes, one at the front and one at the rear. In the oiling system is a neat oil radiator through which the oil is pumped during its circulation to cool it. The workmanship on the car is particularly good, a great deal of it being hand work; for instance, the spring hangers, pump mounting, cylinder plugs and so on are hand cut out of solid blocks of steel.

Burmans Have European Appearance

Burman's two cars, which are his own design, are quite European so far as the motor is concerned. Both of them are alike in every respect, and are four-cylinder creations with the cylinders cast in pairs. They have 5.4 inches bore and 5.5 inches stroke, giving them a piston displacement of 449.4, just within the speedway limit. Although he has shown no exceptionally fast time on the track, Burman says that he has had the motor turning over at 2,400 r.p.m., at which speed it developed 134 horsepower on the block. The distinguishing feature of the motor is its valve operation. The valves are on an angle of about 30 degrees and project directly into the combustion space. There are 16 valves, two exhausts and two intakes to each cylinder, the exhausts being on one side of the cylinders and the intake on the other. They



are comparatively small, being only 2 inches in diameter with a 1-2-inch lift. The valves are operated through two camshafts, one on either side, which operate push-rods, at whose upper ends are connected long walking beams which reach clear across the motor and work the valves on the opposite side. These walking beams are forked so that one push-rod operates the two valves in either cylinder. The walking beams are mounted near their centers on a rather high pillar, one pillar carrying the two rocker arms for a cylinder. A scheme similar to this has been tried out in Europe and discarded on account of poor operation of the valve caused by warping of the forked rocker arms. The pistons are steel and connecting-rods are very light so that high speed may be obtained without undue vibration. Burman uses left drive and center control, and the brakes are operated by cables. The radiator carries a condensing coil in addition to the filler cap and Motometer. Burman carries 35 gallons of gasoline, which he calculates will carry him 350 miles of the race.

Dusenberg with Covered Valves

There are four cars entered which employ the Dusenberg motor, these are the two Dusenbergs, driven by Rickenbacher and Haupt, the Mason driven by George Mason and Chandler's Bull Dog. The first three are alike in practically every respect and simply are refinements of the Masons which have made such a showing within the past few years. The valves extend horizontally into the side of the cylinder, the push rods working in and out instead of up and down. The valves and rocker arms are covered by an aluminum housing, which makes the valve side of the block casting a smooth surface. The valves are operated by vertical rocker arms or walking beams whose lower ends bear on the side of the cams. The

valves open directly into the explosion chamber, so there are no valve pockets. The intake manifold is integral with the cylinder casting and the exhaust casting is directly upward through the top of the cylinders through a sheet metal header, open at both ends on the Mason, while the Dusenbergs have separate exhaust pipes carried out of the hood. The lower end of the inlet passages are cast as a part of the crankcase, on the upper end as a part of the block casting. The valve operating mechanism is lubricated by pumping oil through the hollow rocker arm shaft to the cams and bearings. The cars have turtle backs and a sharp nose.

Keeton a Spectacular Car

Knipper's Keeton is one of the spectacular cars in looks as well as speed, the oddity in looks is due to the radiator location back of the motor; the latter is covered with the sloping European type of hood which is simply a screen. The engine has T-head cylinders, cast in pairs, the four cylinders being 5.1 by 5.5 inches, giving it a displacement of 449.4, the same as the Burmans. The car weighs 2,350 pounds empty, only 100 pounds more in the rear than in the front. There is a special brace to steady the steering column. There are eight spark plugs, with a double distributor magneto; cable brakes and wire wheels are employed as in last year's race. Wire wheels have always been stock equipment on Keeton cars.

King Uses 3-Inch Valves

The King car that is to be driven by Klein has a four-cylinder 5.1 by 5.5-inch motor with pair-cast cylinders. Three-inch valves are used with 9-16-inch lift. A Bosch double distributer magneto supplies current for two spark plugs per cylinder. One plug is located on each side of the T. The car is fitted with a 48-gallon gasoline tank which feeds to a Rayfield carbureter. The oil capacity is 22 gallons. The wheelbase of the King is 112 inches and at the rear of the car cantilever springs are used. The gear ratio is 2 to 1. Present plans call for equipment of Rudge-Whitworth wire wheels, Empire tires 33 by 4.5 inches all around, and Hartford shock absorbers.

Braender Uses Cable Brakes

The Bull Dog, called the Braender Bull Dog, is entered by the maker of Braender tires but was designed by Ralph Mulford and built by Mulford and Chandler, who is to drive it. Its motor is a 350-cubic inch Dusenberg and is a very sturdy and well designed appearing car. The radiator is about 4 feet high by less than half as wide and has a visor at the top. The bonnet ends at the rear in a cowl that almost conceals the driver and the mechanic. The

(*Continued on page* 1146)

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183 Cubic Inches—90 M. P. H.

WHEN a car with 183 cubic inches piston displacement can show a sustained speed of 90 miles per hour why should we continue to limit our motor sizes to 450 cubic inches?

Some years ago when a movement was on to reduce the piston displacement sizes for different classes of racing cars the argument was advanced that higher classes would have to be added to stage races that would interest the spectators. The 600-inch class was added to give what was called interesting speed.

Today the foreign maker is demonstrating that the small motor, 183 cubic inches in America or 3 liters in the French category, can perform better than the majority of larger motors that do not operate at so high efficiency and that have to waste a larger proportion of their power in carrying the needless weight of the larger chassis.

France some months ago gave an excellent exhibition of what the small motor will do in a 2,000-mile reliability run over the mountains, combined with hill-climbs, efficiency trials and ending with a road race, and it looks today as if we shall have an opportunity of seeing what a small foreign motor will do on an American speedway in a 500-mile race.

If the small motor operating at over 2500 revolutions per minute can make good in a 500-mile race there is no reason why it cannot make good in our touring classes and the race of this year should be particularly attractive to all American makers as well as to American buyers.

Representation Below Par

THE representation of American-made cars in the coming Indianapolis race is below par when compared with the finely built European racing cars that they will be pitted against on Saturday when the starting gun is fired at the Indianapolis speedway.

It is regrettable that the $50,000 of the speedway is in reality going begging so far as proportionate American representation is concerned. The twelve foreign cars entered are on an average much in advance of our American entries. True, four or five American companies have entered into the racing spirit in a representative American way but the number of companies represented is by far too small. With France, Germany, Belgium, England and Italy pitted against us on Saturday the best that several of our leading makers could build would not be any too good, and the fact that of the forty-five cars entered thirty-three are American does not mean what these figures indicate when real car merit is taken into consideration.

There are this year too many cars of old vintages entered, cars that were good 3 or 4 years ago but cars that are hopelessly outclassed today. If Europe measures our ability to build racing cars by the number of our cars entered we will appear at a hopeless disadvantage. Fortunately several of the weak ones will be eliminated, but even these weak sisters might be factors if those entering them had taken time by the forelock and had their machines well tested out in advance.

We have been promoting speed events in this country for over 10 years and still the lesson of the early bird winning the prize does not seem to have been taken to heart in the majority of cases. Too many entrants are still unready, re-building their cars the week of the race, wearing out the physical ability and deadening the mental activity of drivers, relief drivers and mechanics, so that they enter the race handicapped physically as well as mentally and bearing the additional burden of a poorly worked-out car. This program is not a good advertisement to American cars, and it is not a good advertisement to the Indianapolis speedway.

We do not get the benefit out of speedway and road racing that we should by leaving off until the last week the things that should have been done weeks ago. That is not the path to progress. The speedway has still many lessons to teach all of us, but unless we are prompt pupils, learning our lessons at home and getting prepared for the day's work we will not make that progress which the expenditure of money would warrant.

The speedway race is now an event of international importance, the foreigner is invading our shores in greater numbers than ever before and it behooves us because of the world-wide advertisement of a speedway victory to come to the front, to produce the best that is in us, to get ready in time and to make the annual speedway classic a great lesson in automobile engineering to our entire country. The lesson is too great a one to be neglected by our manufacturers, our engineers and our automobile racing sportsmen.

Exploit Electric Cars for Parcel Post

Promise of New Field for Electric Commercial Cars Urged Before Electric Vehicle Assn. Meeting and Favorable Activity of Central Stations Assured

NEW YORK CITY, May 22—Parcel post delivery as a field for electric trucks was the subject discussed by the Electric Vehicle Assn. at the May meeting held today in the Consolidated Gas Co. building. F. W. Frueauff, president of the Denver Gas & Electric Co., Denver, Col., and chairman of the National Electric Light Assn. committee on parcel post co-operation, spoke on the revival of action on the part of the central stations in electric vehicle promotion. He stated that formerly the central stations were decidedly passive on the subject, but that thanks to the ceaseless endeavors of the national body and the electric vehicle bodies, they are now recognizing the electric vehicle's possibilities as one of the most promising sources of income as a market for electric current. He asserted, from his extensive and intimate connection with central stations, that they are becoming exceedingly active, and that much is to be expected from their efforts in this direction.

James H. McGraw, president of the McGraw Publishing Co., and chairman of the parcel post delivery committee of the Electric Vehicle Assn. of America, presented an interesting paper on the development of the parcel post and its possibilities in connection with the use of electric vehicles.

W. P. Kennedy, of the E. V. A. parcel post committee, briefly digested the work of the committee as reported in the brochure "The Electric Vehicle in Parcel Post Service for Economy and Reliability" published by the association for general distribution.

Mr. Kennedy also explained in what manner electric vehicle service was contracted for by the government. He explained that with the exception of a few experimental vehicles in Washington, Indianapolis and elsewhere, that electric and gasoline trucks used by the post office were operated by contractors, these being selected according to bids.

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Proceedings Against Marathon Dismissed

NASHVILLE, TENN., May 25—An application for a receiver in bankruptcy against the Marathon Motor Works was applied for the early part of last week and this application was heard before the referee in bankruptcy on May 22. As the evidence submitted showed the assets of the Marathon Motor Works greatly in excess of its liabilities, the application for the receiver was dismissed.

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Tourist Trophy Race June 10-11

LONDON, ENGLAND, May 23—The Tourist Trophy Race will be held in the Isle of Man on June 10 and 11. There will be five prizes in all offered to the winners. The proprietors of the *Daily Telegraph* are offering the Tourist Trophy and $5,000, also $1,000 to the winner of second place. A team prize of $1,500 and a fuel prize of $500, for the best performance on a fuel other than exclusively petrol, is also offered by the same people. The Henry Edmunds Challenge trophy is offered for competition, and will be won by the entrant whose car makes the best aggregate time during the sixteen laps of the race. The race will be on the now historical Isle of Man course, the circuit of which is 37 miles 4 furlongs. The mountain road to the summit of Snaefell reaches an altitude of 1,596 feet. The total distance of the race is 600 miles. The race is for cars fitted with internal combustion engines having not less than four cylinders, the cubic capacity of which shall not exceed 207 cubic inches. There are twenty-three entries thus far for the start on the first day's run.

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Big Sale Cuts Goodyear Block Tire Prices

NEW YORK CITY, May 22—The Goodyear Tire & Rubber Co. has announced a reduction of approximately 5 per cent. in the price of its individual block motor truck tires. A truck owner can now buy a block tire at the same price he would have to pay for a demountable or pressed-on tire. Two of the most popular sizes in this type of truck tire are the 36 by 5 and the 36 by 6 The former size has come down 5.7 per cent., the new price being $118.47, while the former price was $125.62. The latter size has come down to $147.62, or approximately 9 per cent., the former price being $157.94. According to advice received from the factory at Akron, this was made possible by the constantly increasing demand for this type of tire by the truck operators. Raising the production volume lowered the cost to an extent sufficient to warrant a decrease in selling price.

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Cadillac Motor in Non-Stop Run

JERSEY CITY, N. J., May 22—A Cadillac motor owned by the Crescent Automobile Co., this city, has been running since April 8 and has run a distance equivalent to 22,000 miles over the road. It is said to have shown no signs of overheating, although only 1 1-2 pints of water have been poured into the radiator. The cylinders and bearings are lubricated with Polarine oil, fed at the rate of twenty-six drops a minute. The motor has been run at from 600 to 700 revolutions per minute, making about 535 miles a day, or a little over 22 miles per hour. It has averaged 44 miles to a gallon of Standard motor gasoline.

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Electric Averages 22.8 M.P.H. in Run

NEW YORK CITY, May 25—The first run ever made by an electric car from this city to Boston inside of 24 hours has been made by a Bailey electric. The distance of 247.8 miles was covered in 23 hours and 9 minutes elapsed time. The actual running time was 10 hours and 52 minutes, while the average speed for the distance was 22.8 miles per hour. The car was a stock Bailey roadster, manufactured at Amesbury, Mass., by S. R. Bailey & Co., Inc., and was equipped with sixty cells of A-5 Edison battery. The current was charged into the battery at convenient points along the way when stopping for meals or for rest.

The following table gives the complete data of the run:

	Miles	Time Running	Miles per Hour	Time Not Running	Time Boosting	Ampere Hours	Ampere Hours per mile
Left Boston..... 4:12 AM							
Arr. at Worcester. 5:58 AM	42.5	1:46	24			141	3.32
Left Worcester.... 8:29 AM				2:31	1:55		
Arr. Springfield...10:37 AM	51.7	2:08	24.2			150	2.9
Left Springfield.... 2:10 PM				3:33	3:10		
Arr. at Hartford.. 3:13 PM	27.3	1:03	26			87	2.3
Left Hartford..... 4:00 PM				0:47	0:33		
Arr. at New Haven 5:47 PM	41.2	1:47	23.1			120	2.91
Left New Haven... 9:27 PM				3:40	3:15		
Arr. at Stamford...11:17 PM	42.0	1:50	22.9			117	2.79
Left Stamford..... 1:03 AM				1:46	1:30		
Arr. at New York. 3:21 AM	43.1	2:18	18.9			138	3.02
Boston to Stamford.....	204.7	8:34	23.9	10:31	8:53	615	3
Boston to New York.....	247.8	10:52	22.8	12:17	10:23	753	3.04

—

American Electric Starter Absorbs Disco

DETROIT, MICH., May 26—The American Electric Starter Co. has been organized by Mansell Hackett, head of the Disco company, which has been absorbed by the new concern. The American Electric Starter Co. is capitalized at $250,000 and has been incorporated by T. G. Murton, N. M. Guy and J. E. Olsen. It will make self-starters. A new single unit machine having ignition starting and lighting functions, which has been designed by Jos. Lamb will be marketed. The new company will supply the Krit, Paige-Detroit, Canadian Brockville-Atlas, the successors of the American Atlas, and other concerns with its new self-starter and will also make starters for front attachment to Packards.

A Small Car for $450 with Palmer-Singer Name?

Purchaser of Bankrupt Property Has Ambitions in "Cyke" Field—Trustee's Auction Brings $14,000

NEW YORK CITY, May 25—If the plans of William Wooster, of the Auto Surplus Stock Syndicate, New York City, mature, it will be possible before the end of the summer to buy a Palmer-Singer car for about $450. It will not be the luxurious creation which has heretofore borne that name, but the name, nevertheless, will appear upon the vehicle.

Wooster, who is associated in business with his father, John Wooster, at 875 Seventh avenue, purchased the machinery and most of the stock and parts at the bankruptcy sale of the Palmer & Singer Mfg. Co., Long Island City, N. Y., May 22, and stated that he had plans to enter the car manufacturing business, building a small car with a Continental motor and other standard parts in the less than $500 class. The name Palmer & Singer was included in his purchase.

The assets of the company brought between $14,000 and $15,000, which is slightly in excess of their actual appraised value. Wooster's bid amounted to $10,101. The next largest buyer was a syndicate made up of Morris Frieders, New York; Henry Frank, New York; Theodore Friedenberg, Manhattan Machinery Exchange, New York; Harry Benjamin, New York; John Nuttel, Philadelphia, and the New Jersey Machine Co., Newark, N. J. All are machinery jobbers. Their purchase consists of stock, parts and odds and ends of every description to the extent of about $2,000. In addition about the same amount was bid in by an army of junk men.

Of the materials purchased by the syndicate, Wooster has already arranged to buy about $1,500 worth and negotiations are under way for his purchase of the remainder. He also is dickering for the lease of the building in Long Island City which is owned by Chauncey Marshall and was utilized under lease by the Palmer & Singer company. It is a three-story structure without basement, 115 by 200 feet, affording 63,000 feet of floor space.

The sale was conducted for Trustee Charles A. Wadley by Auctioneer Henry C. Johnson, Jr. Attorney Edwin L. Garvin represented the trustee. The old Palmer-Singer car sold at $2,295 and $2,495; when the company failed, Charles A. Singer at once formulated plans for building a car under the name Singer.

Metropolitan S. A. E. Postpones Meeting

NEW YORK CITY, May 25—Due to the holding of the Indianapolis Speedway Races on the 30th of May, 2 days after the regular time set for the Metropolitan Section meeting, the regular meeting of the Metropolitan Section of the Society of Automobile Engineers will be held Friday, June 5. At this meeting an effort will be made to secure the views of members relative to the subject of the ideal car, which is scheduled for discussion at the summer meeting of the Society in June. Members are requested to contribute their views as to the type of car which will enjoy the most popularity during the coming season and to point out what improvements they believe should be made in present day design and construction.

Improved Westcott To Sell at $1,285

RICHMOND, IND., May 23—Though a number of important improvements have been made in the latest model of the Westcott car, manufactured by the Westcott Motor Car Co., Richmond, Ind., no increase in price has followed. On the contrary, the figure has been reduced by $100—from $1,385 to $1,285.

The Northway motor still is used, but it is of a later model and is of the unit power plant type instead of having the gearset mounted separately. Tires now are 33 by 4 Goodrich, instead of 3 1-2, and the wheelbase has been increased from 110 inches to 113. The body has been redesigned and is of the streamline type.

The motor has block-cast L-head cylinders 3 1-2 by 5, the S. A. E. horsepower rating being 19.6, self-contained constant level lubricating system with sight feed, 3-bearing crankshaft and Schebler model R carbureter with hot air jacket and pipe. Electric lighting, starting and ignition functions are combined in the Jones unit system, with Atwater-Kent distributer. The cooling water is pump circulated through a honeycomb radiator with German silver case. Left steer is employed, with center control of the three-speed gearset. The clutch is a leather-faced cone. The rear axle is three-quarters floating.

Included in the equipment are silk mohair top with inside-hung curtains, black enameled, nickel trimmed bullet lamps, instrument board on cowl with oil sight feed, switch, Stewart speedometer with electric light, and switches, coat and foot rails, electric horn, tire carrier in rear and the usual tools. The price is the same for either 5-passenger touring or roadster models.

Sparton Scores a Point—Injunction Denied

DETROIT, MICH., May 27—*Special to* THE AUTOMOBILE:—Federal Judge Tuttle Monday morning denied a motion for an injunction against the Sparks-Withington Co., of Jackson, Mich., and the Hudson Motor Car Co., Detroit, maker and user, respectively, of Sparton horns. The injunction was requested by the Lovell-McConnell Mfg. Co., Newark, N. J., which alleged that the Sparton horn is an infringement of patents Nos. 923,048, 923,049 and 923,122, covering the construction of the Klaxon types of horn. In commenting on the reasons for denying the injunction, Judge Tuttle said that he believes it is far better for a company desiring to stop the sale of products believed to be infringements on its patents to litigate the case rather than to obtain an injunction.

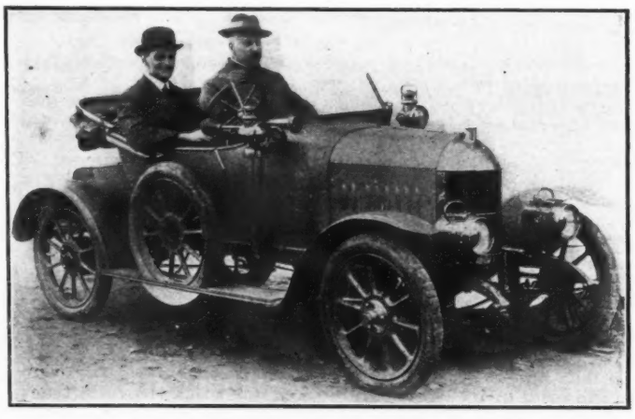
New Motor Fuel Called Economin

NEW YORK CITY, May 22—A new fuel for automobile and other internal-combustion engines is announced in British papers under the name of Economin. This has for its base 80 per cent. of kerosene, the remainder being chemicals which form an emulsion. Then the mixture is distilled and gives a fuel which is cheaper than gasoline, in England at least, and which gives more power from the same motor. It is further claimed to give practically perfect combustion so that there is almost no carbon deposit in the cylinders, to be almost odorless and to make an easy starting. It can be used with the same carbureter adjustment as gasoline. The fuel is not yet on the market but a plant to turn out 20,000,000 gallons a year is under construction.

Continental Motors in New British Car

NEW YORK CITY, May 25.—W. R. Morris of the W. R. Motors, Ltd., Oxford, England, has placed a contract with the Continental Motor Mfg. Co., Detroit, Mich., for 5,000 motors to be used in a car which he will assemble on the other side. The new car will sell for about $500.

The motor which Morris will use in his car, the Morris-Oxford, is the Continental model U. It is distinctly a new type in American manufacture. The bore and stroke are 2 3-4 by 4; the crankcase and cylinders are cast in one piece; the oil pan is of aluminum; the crankshaft has three liberal sized bearings; lubrication is by a complete force feed system; the lines are European. The Morris factory is in Oxford, the seat of Oxford University, 64 miles from London. He has facilities there for turning out on the assembling plan about 100 cars per week, but will probably find it necessary very soon to increase his capacity.



New British Morris-Oxford, which is to use Continental motor

Car in River Not Construed as Damaged by Collision

Wisconsin Supreme Court Decides Policy "Rider" Did Not Protect Against Loss by Immersion

MILWAUKEE, WIS., May 22—The supreme court of Wisconsin has reversed the decision of the circuit court in the case of F. Felix Wettengill, Appleton, Wis., against the United States Lloyds, involving a claim for damages for injury to Mr. Wettengill's car which ran into a river while being driven by another than the owner. The decision is of wide interest because of the principle of liability insurance involved.

Mr. Wettengill insured his car in the Lloyds against loss or damage by fire and theft, with a rider that in consideration of the payment of an additional premium, he would be insured against damage by collision "excluding damage caused by striking any parts of the roadbed, rails or ties of any street, steam or electric railway." One evening Mr. Wettengill permitted his brother-in-law to use the machine. He was speeding it on a road near Green Bay, Wis., and was unable to make a sharp turn. The road runs parallel to East river and at the curve the car shot from the road and down an embankment into the stream. The driver drowned.

Mr. Wettengill was refused payment of damages on his claim under the collision rider and brought suit to collect damages. He claimed the river was an obstacle or object of collision and the circuit court upheld his claim and awarded him damages. The Lloyds concern appealed the case to the state supreme court, which hands down a decision reversing the circuit court on the ground that the accident to the car was not such a collision as was contemplated by the policy, and Mr. Wettengill therefore had no grounds for claim for damages.

It is possible that Mr. Wettengill will appeal the case to the next higher court and, if so, the decision will be watched with much interest by motorists and insurance men. It is believed to be the first case ever brought in the United States to secure a construction of the actual effect of the extra-payment clauses of policies concerning coverage for liability due to collision.

—

Owner Liable for Collision When Agent Drives

BOSTON, MASS., May 23—An interesting point from the angle of legal practice as to responsibility in motor accidents was settled by a jury today in the Massachusetts Superior Court before Judge Lawson.

On July 3, 1913, a motor car owned by William Graustein was going to Hartford with a party. A motor car owned by Mrs. Mildred Smith of Northboro was being driven to Boston to be repaired. There was a collision and members of the Graustein party were injured. Suit was brought by Graustein's party against Mrs. Smith and James W. Maguire, Boston agent for the Pierce Arrow. The testimony showed that Mrs. Smith had telephoned to Mr. Maguire that her car needed an overhauling. Maguire's foreman answered that Mrs. Smith must send the car to Boston, and it was arranged that an employee of Maguire should go to Northboro and drive the car to the repair shop. Gilson was at the wheel when the accident happened. So the suits charged Mrs. Smith and Maguire with being responsible jointly, the former as owner of the car and the latter because his man was at the wheel.

The jury returned a verdict against Mrs. Smith for $8,600, but the suits against Mr. Maguire were thrown out by the jury on the ground that he was not to blame for his employee's act. Graustein sued Mr. Maguire separately for damages to his car. This, too, was thrown out by the jury.

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Two More Perpetual Decrees for Klaxon

NEW YORK CITY, May 25—Final decree in favor of the plaintiff has been issued in the case of the Lovell-McConnell Mfg. Co., against the Salvini Electric Horn Mfg. Co. Inc., by Judge Hand in the U. S. District Court of the Southern District of New York. The defendant assented to the granting of a perpetual injunction in favor of the Lovell-McConnell Mfg. Co and waived the right to appeal the case, while the plaintiff waived all question of costs, damages and profits resulting from the infringement of its patents Nos. 923,048, 923,049 and 923,122. The board of directors of the Salvini company sanctioned the arrangement. The order was signed by Judge Hand.

A similar settlement was made in the case of the Lovell-McConnell Mfg. Co., against the Square Motor Horn Co., the court issuing a perpetual injunction in favor of the former who agreed to waive all question of costs, profits and damages in connection with the infringements of its patents by the Square Horn Company and the board of directors of the latter company assented to the granting of the perpetual injunction against further infringement.

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Parsons Patent Upheld in Tire Grip Action

NEW YORK CITY, May 25—In the case of the Parsons Non-Skid Co. versus the Leather Tire Goods Co., in the U. S. District Court for the Southern District of New York Judge Mayer has granted a preliminary injunction on default following a motion for the same by the Parsons Non-Skid Co.

The plaintiff charges infringement of the Parsons' patent No. 723,999 covering the well known Weed chain tire grip construction.

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Frontier Co. Sues K.-W. for Infringing

CLEVELAND, O., May 23—In equity action brought by the Frontier Specialty Co. of Buffalo, N. Y. against the K.-W Ignition Co. of Cleveland, infringement on two patents for spark plugs is charged. The Frontier, by William J. White, president, alleges patents Nos. 642,167 and 915,896 were granted to John G. Shea of Detroit, the latter patent having been granted March 23, 1909. Infringement on features of the spark plug is alleged and the value of these features is set at more than $20,000. Action was brought in United States District Court, Judge W. L. Day, and hearing will be set soon.

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Begin Rim Infringement Action

CLEVELAND, O., May 23—Charging that Ralph P. Brown and Maynard N. Davis, Cleveland dealers for the Allen Motor Car Co., Fostoria, O., are infringing the John Baker rim patent, No. 707,538, the Standard Welding Co., Cleveland, has filed suit against them in the United States District Court in that city.

The suit is aimed indirectly at the Allen company. The patent covers a rim which contracts and expands for insertion in a tire. The Standard Welding Co. asks an injunction, an accounting and damages.

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N. Y. Garage Separator Hearing Delayed

NEW YORK CITY, May 22—There was no definite action taken at the hearing before the general welfare committee of the board of aldermen on the question of oil separators for garages. The fire department obtained a postponement of the hearing until June 12 because its chemist could not be present at the meeting to report on tests made. Pending the coming hearing all processes against garages and all attempts to enforce the ordinance will be suspended.

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Kantalever Spring Repairer Protected

NEW YORK CITY, May 25—In the case of the Motor Car Equipment Co. against Wm. Wooster, trading under the name of the Auto Surplus Stock Syndicate, Judge Mayer sitting in the U. S. District Court for the Southern District of New York has ordered the Motor Car Equipment Co. to collect damages and all profits accruing to the defendant from its infringement of the patent covering the Kantalever Emergency Spring Repairer. The case has been referred to W. H. K. Davey as master to ascertain and report on the amount of damages and profits of the defendant resulting from the infringement of the Dudley Pierce Power patent No. 902,250 granted October 27, 1908, and owned by the plaintiff.

The bill of complaint in the suit was filed February 19, 1914, and as the defendant failed to answer the bill was taken as a decree *pro confesso*. Thereafter 30 days having elapsed, the court ordered the plaintiff to recover the damages and profits mentioned. In regard to increasing the damages to three times the actual damages, the court ruled that this be postponed till the presentation of the Master's report. The plaintiff has also to recover from the defendant for all costs and disbursements.

Overland Absorbs Kinsey—Annual Inventory June 13

Big Plants to Shut Down for Two Weeks—Production for 1915 Set at 75,000

TOLEDO, O., May 23—The Willys-Overland Co. has taken over the plant of the Kinsey Mfg. Co., which will in the future be operated as a department of the Willys-Overland plant. The stock of the Kinsey Mfg. Co. was owned almost entirely by Willys-Overland and the merger has little meaning save the abolishment of the Kinsey Co.'s office force. The Kinsey Co. was capitalized at $100,000 and the officers were: president, Isaac Kinsey; vice-president, John N. Willys, president of the Willys-Overland Co.; secretary, Homer V. Hawk; treasurer, Walter Stewart. Under the new arrangement Mr. Kinsey and the other officials of the Kinsey Mfg. Co. will become a part of the official staff of the Willys-Overland Co. The Kinsey Mfg. Co. has been engaged in making parts of various kinds.

The Willys-Overland plant will shut down for inventory about June 13 and will re-open two weeks later for the 1915 season. It is the announced intention of the concern to turn out 75,000 cars during the season. The Willys-Overland plant is now engaged on new buildings which will cost approximately a million dollars and it is stated that about 1,000 additional men will be employed when these improvements have been completed.

Ford Fights Cut Prices in Britain

LONDON, ENG., May 22—The right of the Ford Motor Mfg. Co. to fix the minimum price of Ford cars in England is again to be contested in the High Court of Justice. The Ford company this year obtained a court decision entitling it to say what was the lowest price at which its automobiles should be sold here; but the judges held that it had failed to prove the damage resulting from one of its London agents underselling others, although it was entitled to collect penalties for breach of contract.

It is said that one of the chief causes of the litigation is the fact that certain English automobile manufacturers are endeavoring to check the Ford enterprise on this side, the large sale of Ford cars here having had a disastrous effect upon English car sales.

Application was made today to the Court of Appeals for permission to reargue the case before three Lords Justices of Appeal. This was allowed and the Ford company received an extension of time to present its case.

Market Reports for the Week

Changes in this week's markets were few. Copper was dull and largely nominal in the local markets last week, electrolytic being available at $0.14 1-10 while the Lake came down to $0.14 1-8. Tin was firmer but quiet at the close on Tuesday, when the price was $33.25 per 100 pounds, a rise of $0.35. Lead is dull and steady. The cottonseed oil market was again without a decided tendency. Values remained rather close to previous levels for the greater part of the week. The consuming demand is intermittent. The crude rubber situation lacked new features of importance last week. In London the market was firm for both the Brazilian and the plantation grades. Here in New York the market was steadier, with $0.71 demanded for Up-River fine on the spot. The Rubber Club of America has gone on record as opposing pending legislation in Congress for the creation of an Interstate Trade Commission.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.05¾	.05¾	.05¾	.05¾	.05¾	.05¾	.....
Beams & Channels, 100 lbs.	1.26	1.26	1.26	1.26	1.26	1.26	.....
Bessemer steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	.....
Copper, Elec., lb.	.14⅛	.14⅛	.14⅛	.14⅛	.14⅛	.14⅛	.....
Copper, Lake, lb.	.14¼	.14¼	.14¼	.14¼	.14¼	.14⅛	—.00⅛
Cottonseed Oil, bbl.	7.00	7.00	7.00	7.00	7.09	7.13	+.13
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.16	.16	.16	.16	.16	.16	.....
Lard oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	3.90	3.90	3.90	3.90	3.90	3.90	.....
Linseed oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	20.00	20.00	20.00	20.00	20.00	20.00	.....
Petroleum, bbl., Kans., crude	.75	.75	.75	.75	.75	.75	.....
Petroleum, bbl., Pa., crude	1.90	1.90	1.90	1.90	1.90	1.90	.....
Rapeseed Oil, refined	.59	.59	.59	.59	.59	.59	.....
Rubber, Fine Up-River, Para	.71	.71	.71	.70	.70	.71	.....
Silk, raw, Ital.	..	5.10	..	..	5.10	5.10	.....
Silk, raw, Japan	..	4.50	..	..	4.50	4.50	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	32.90	33.20	33.25	33 25	33.20	33.25	+.35
Tire scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

Reo Declares 50 Per Cent. Dividend

LANSING, MICH., May 20—The Reo M. C. Co., at a meeting of the directors in this city today declared a stock dividend distribution of 50 per cent. of the capital stock, payable on June 1 to holders of record May 28. The capital stock is $2,000,000, all one class. The additional stock distribution will bring the total capitalization to $3,000,000. The amount of new stock to be given will be $1,000,000 of $10 par value. The earnings of the Reo company were reported the largest in the history of the company, being estimated in excess of 50 per cent. per annum.

Big Gains for Gray & Davis

BOSTON, MASS., May 22—Gross sales of Gray & Davis, it is understood, are running about 36 per cent. ahead of a year ago, which if maintained, would mean gross for the year of considerably better than $4,000,000. Within the last 20 days the company has received orders for between 60,000 and 65,000 systems, one contract alone calling for 20,000 sets. Contracts with the Peerless and Stearns companies for 1915 have been signed up. The company has taken care of a large portion of the current needs of its business through a sale of about 16,000 shares of its preferred stock which netted the company par. There is now $500,000 preferred outstanding out of a total issue of $1,000,000 and $500,000 common outstanding out of $750,000 authorized.

Pope Again Heads Manufacturers' Association

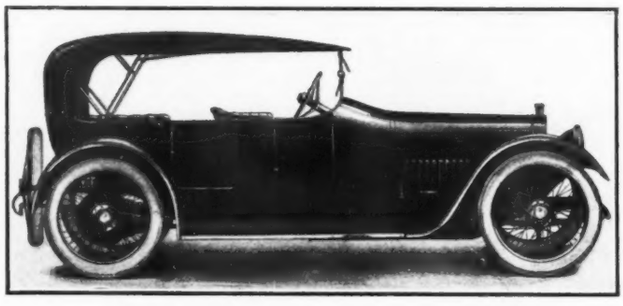
NEW YORK CITY, May 23—The directors of the National Assn. of Manufacturers met at the Waldorf-Astoria recently, and elected Col. George Pope of Hartford, Conn., president; A. B. See, New York City, treasurer; J. P. Bird, general manager and assistant treasurer, and G. B. Boudinot, secretary.

A Standard Oil Gasoline Price Cut

NEW YORK CITY, May 21—The high prices of light crude oil of 21 gravity or higher established in 1912 were yesterday cut to independent dealers by the Standard Oil Co. of California. In all the grades included a reduction of 5 cents a barrel was made. Gasoline also sold 1-2 cent a gallon lower beginning yesterday. The company has 13,000,000 barrels of light crude oil in storage.

Lengthen 1915 Pullman 6-48

YORK, PA., May 26—The Pullman Motor Car Co. of York, Pa., has announced that it will continue the model 6-48 in practically the same form as was introduced at the last New York Show. There have been some refinements, however, the wheelbase having been lengthened 4 inches, making it



New 1915 Pullman Model 6-48 with 134-inch wheelbase

134, and this of course has necessitated a larger body and a strengthening of the spring suspension although the car has been lightened throughout. The body has 2 more inches room in the driver's compartment and 6 inches in the tonneau. The seats have been widened and deepened, the rear doors brought back and a leatherette top is used in place of mohair. The dash is now covered with leather and a 12 volt electric system used for starting, lighting and gear-shifting. A lighter radiator with larger cooling capacity has been fitted. The price remains the same at $2,350 with wider wheels. Fitted with the Vulcan electric gearshift an additional charge of $150 is made.

Bumper Guayule Crop in War Zone

ALPINE, TEXAS, May 23—The protracted warfare in Northern Mexico has had the effect of giving the wild guayule shrubs upon the ranches an opportunity to grow undisturbed, thus replenishing the supply of material for manufacturing crude rubber. Practically all of the guayule rubber factories in the Torreon district, where the industry was chiefly carried on, have been closed down for much of the time during the last three years. Even the factories that kept running drew their supply of raw material from stocks already on hand.

Most of the guayule shrubbery that a few years ago covered a considerable scope of territory in this upper border region of Texas has been exhausted by the rubber factory at Marathon, Texas. Recently representatives of a Mexican rubber factory, in the state of Coahuila found millions of acres of land covered with the valuable shrub. This may be of great value to tire makers.

Overland Profits May Reach $6,000,000

NEW YORK CITY, May 25—The remarkable earnings of the Willys-Overland Co. this year might easily account for recent strength in the common stock, which within a week has advanced eleven points to 75 and is 21 points above March quotations. It is hinted in certain quarters, however, that the management may abandon its original intention not to pay an extra dividend this year. In the 1913 year the regular 6 per cent. was paid on the common and 5 per cent. extra at the close of the fiscal period. The management stated last fall that it would not probably pay an extra this year, but earnings have been so large that it would not be impossible if common shareholders had a pleasant surprise in store.

The fiscal year ends in another month, and based on 10 months' record it is probable that final net profits will cross the $6,000,000 mark, equal to about 30 per cent. on $20,000,000 common. It is understood that early in 1914 a block of about $1,000,000 common was distributed to investors at around 56. This has been entirely marketed and no large blocks of common are now hanging over the market.

Willys-Overland this fiscal year is practically certain to make and sell 45,000 cars against 31,000 in 1913.

Automobile Securities Quotations

NEW YORK CITY, May 27—The market for automobile securities was comparatively inactive during the past week, the general trend, however, being optimistic, the only decreases in quotation noted being slight variations of one or two points due simply to the ordinary market fluctuation.

The reports of good business which are now general throughout the automobile and allied industries, were reflected in the continued strength of several stocks such as Chalmers Motor which gained 6 points on the common and 1 1-2 on the preferred during the week. Maxwell motor which showed an increase of 4 1-2 points on the common, 3.5 on the first preferred and 2 3-8 on the second; Packard gained 1 1-2 points on the preferred; Ajax-Grieb rubber with an increase of 5 points on the common; Vacuum Oil which is up 5 points as compared with last week; and Willys-Overland which continues strong with a gain of 6 points on the common and 2 on the preferred. The complete list of quotations for the past week follows:

	Wednesday		Thursday		Friday		Saturday		Monday		Tuesday		Week's	1913	
Security	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Change	Bid	Asked
Ajax-Grieb Rubber Co. com	215	..	215	..	215	..	215	..	220	..	220	..	+5	155	..
Ajax-Grieb Rubber Co. pfd	99	..	99	..	99	..	99	..	99	..	99	..	..	95	100
Aluminum Castings pfd	98	100	98	100	98	100	98	100	98	100	98	100	..	98	100
Case T. M. Co., J. I	82	95	82	90	82	90	82	90	84	87	84	87	+3	..	..
Chalmers Motor Co. com	94	98	94	98	94	98	94	98	100	..	100	..	+6	129	138
Chalmers Motor Co. pfd	90½	92½	90½	92½	90½	92½	90½	92½	92	..	92	..	+1½	98	102
Electric Storage Battery Co	51½	52¼	52	52¼	51¾	52½	52	53	52	53	52	53	— ¾	..	..
Firestone Tire & Rubber Co. com	302	307	302	307	302	307	302	307	303	307	303	307	+1	257	258
Firestone Tire & Rubber Co. pfd	108	110	108	110	108	110	108	110	107	110	107	110	—1	105	107
Garford Co. pfd	75	85	75	85	75	85	75	85	75	85	75	85	..	..	97½
General Motors Co. com	83½	85	83½	84	83½	84	83½	84	83½	84½	83½	84½	..	27	30
General Motors Co. pfd	93	93½	93	94	93½	93¾	93½	93¾	93	94	93	94	..	72	76
B. F. Goodrich Co. com	25¼	25¾	25⅜	25¾	25⅛	25¼	25½	26¼	25	26	25	26	—1	31½	32½
B. F. Goodrich Co. pfd	89	90	87	89½	87	90	86	89	88	90	88	90	—1½	91	94
Goodyear Tire & Rubber Co. com	177	182	177	182	177	182	177	182	178	182	178	182	+1	315	322
Goodyear Tire & Rubber Co. pfd	98	100	98	100	98	100	98	100	98½	100	98½	100	+ ½	98	99¼
Gray & Davis Co. pfd	95	102½	95	102½	97	102½	97	102½	95	102½	95	102½	..	..	..
International Motor Co. com	..	5	..	5	..	5	..	5	..	5	..	5	..	5	6
International Motor Co. pfd	3	10	3	10	3	10	3	10	3	10	3	10	..	10	15
Kelly-Springfield Tire Co. com	50	53	52	53	52	53	52	53	52	53	52	53	..	..	..
Kelly-Springfield Tire Co. pfd	135	142	135	142	135	145	135	145	132	137	135	143	..	..	..
Lozier Motor Co. com	..	30	..	30	..	30	..	30	..	26	..	26	..	15	20
Lozier Motor Co. pfd	30	45	30	45	30	45	30	45	30	43	30	43	..	..	92
Maxwell Motor Co. com	11⅛	11⅜	12¾	13	13⅞	14	14⅛	14¼	14½	15	15½	15¾	+4½	2½	4
Maxwell Motor Co. 1st pfd	43½	44	45⅜	45⅞	46½	47½	46½	47½	46½	47	47	47¾	+3½	30	40
Maxwell Motor Co. 2d pfd	18⅛	18⅜	19½	19¾	20	20¼	20	20½	20½	21	20⅛	20½	+2⅜	11	15
Miller Rubber Co	130	135	130	135	130	135	130	135	128	135	128	135	—2	140	150
New Departure Mfg. Co. com	123	125	123	125	123	125	123	125	122½	124	122½	124	— ½	..	..
New Departure Mfg. Co. pfd	105½	..	105½	..	105½	..	105½	..	105	107	105	107	— ½	..	..
Packard Motor Co. com	103	..	103	..	103	..	103	..	103	..	103	..	..	..	..
Packard Motor Co. pfd	97	..	97	..	97	..	97	..	98½	100½	98½	100½	+1½	98	102
Peerless Motor Co. com	18	25	18	25	18	25	18	25	18	25	18	25	..	45	50
Peerless Motor Co. pfd	..	62½	..	62½	..	62½	..	62½	..	62½	..	62½	..	..	96
Pope Mfg. Co. com	..	1½	..	1½	..	1½	..	1½	..	1½	..	1½	..	15	16
Pope Mfg. Co. pfd	..	8	..	8	..	8	..	8	..	8	..	8	..	47	49
Portage Rubber Co. com	..	40	..	40	..	40	..	40	..	40	..	40	..	35	45
Portage Rubber Co. pfd	..	90	..	90	..	90	..	90	..	90	..	90	..	90	95
*Reo Motor Truck Co	8¾	9¼	8¾	9¼	8¾	9¼	8¾	9¼	8¾	9¼	8¾	9¼	..	10½	11½
*Reo Motor Car Co	25½	28½	25½	28½	25½	28½	25½	28½	27	28½	27	28½	+1½	20	21
Rubber Goods Mfg. Co. pfd	100	110	100	110	100	110	100	110	100	110	100	110	..	..	..
Russell Motor Co. com	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Russell Motor Co. pfd	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Splitdorf Electric Co. pfd	40	50	40	50	40	50	40	50	40	50	40	50	..	..	..
Stewart Warner Speedometer Corp. com	48	50	48	50	48	50	48	50	47	49	47	49	—1	..	..
Stewart Warner Speedometer Corp. pfd	99	100	99	100	99	100	99	100	97	99	97	99	—2	..	..
Studebaker Co. com	32¾	34	32½	33½	32½	34	33½	34½	33½	34½	33½	34½	— ½	26½	27
Studebaker Co. pfd	89¼	90¼	89	90½	88¾	90	89¼	90¼	90	91	90	91	— ½	90	91
Swinehart Tire & Rubber Co	65	70	65	70	65	70	65	70	65	75	65	75	..	85	88
Texas Company	140⅛	142	139½	141½	139½	141	140	142	140½	141½	140½	141½	+ ½	..	..
U. S. Rubber Co. com	58½	59	58	58¼	58	58½	58¾	59⅜	57½	58	57½	58	—1	62½	63
U. S. Rubber Co. 1st pfd	102⅜	102⅞	102	103	102	103	102½	103	102½	103	102½	103	..	104¾	105¼
Vacuum Oil Co	217	223	216	219	216	220	217	222	217	220	223	225	+5	..	..
White Co. pfd	107	110	107	110	107	110	107	110	107	110	107	110	..	107	110
Willys-Overland Co. com	72	72½	73	75	72	74	72	73	72	74	75	75½	+6	60	65
Willys-Overland Co. pfd	92½	95	92½	95	94	96	94	96	92	94	94	95	+2	86	92

*The par value of these stocks is $10; all others $100.

Want Walpole Tire Company Sale on June 24

Receivers Recommend Deposit Reduction to $25,000—Without Upset Price—Sale About July 1

BOSTON, MASS., May 22—At a hearing before Judge Dodge in the U. S. District Court, counsel for the receivers of the Walpole Tire & Rubber Co., recommended that the property of the company be offered for sale at public auction on or about June 24 in one lot and without an upset price. An attempt to sell the property on May 11 failed as the only bid received was for $800,000, as against an upset price of $1,150,000. Receivers also recommend that the cash deposit required be reduced from $60,000 to $25,000.

The proposed plan of disposing of the property in one lot as a going concern was objected to by counsel for the creditors' committee who stated that this committee plans to submit a bid for the property and desires to be able to bid for parts as well as the whole. He asked for a postponement of the settlement of the decree for 2 weeks which was granted.

The motion of counsel for the creditors' committee for a postponement was granted, and the matter will again come before the court at 10 a. m., June 1. Under the law the sale of the company's real estate must be advertised once a week for 4 weeks prior to the sale, so that the sale cannot now be held much before July 1.

Ready To Make Hydraulic Transmission

STEVENS POINT, WIS., May 22—The Beijer Hydraulic Transmission Co., organized at Stevens Point, Wis., several months ago by Arthur A. Beijer, designer and inventor of a gearless transmission system for motor cars and trucks, has perfected its organization and is preparing to engage actively in manufacturing. The officers are: president, N. A. Week; vice-president, James Mainland; secretary and treasurer, C. S. Orthman; superintendent and manager, A. A. Beijer. The stock is owned by Stevens Point business men and Mr. Beijer and a sufficient amount has been subscribed to carry on the business on a fairly large scale. The Beijer transmission consists of a rotating cylinder pump in the flywheel of the engine and a hydraulic motor built on each of the four wheels of the vehicle. The pump and four motors are connected by means of a series of pipes through which oil is pumped to operate the motors and thus the wheels. Speeds are governed by lengthening or shortening the stroke of the pump. To obtain a reverse speed the oil is pumped through the pipes in a reversed direction. The Beijer transmission eliminates all gears, clutches, brakes, universal joints, differential and many other complications present in the ordinary motor vehicle. It is also claimed to give extreme flexibility and smoothness of action.

Colorado To Gulf Tourists Finish Run

GALVESTON, TEX., May 21—The members of the Colorado to the gulf automobile sociability run closed that run on May 18 when eight cars carrying thirty-two representative business men from Pueblo, Colorado Springs and Manitou reached this city after a 10 days' run from Pikes Peak. The run was 1,250 miles long. The return trip started on May 18 and the tourists will strike the Santa Fe Trail through Kansas back to the starting points in Colorado. Within the next year or two, it is predicted by the Coloradoans, there will be a graded dirt road, with many gravelled, shell and macadamized sections, running the entire 1,250 miles from the Gulf to Colorado.

"Cyke" Dealers Organize in Philly

PHILADELPHIA, PA., May 23—As indicative of the growth of the cyclecar industry in Philadelphia, dealers in the little car have become so numerous that it was considered advisable to effect some sort of organization. At a well-attended meeting held in the motor mart Thursday evening the Cyclecar Assn. of Philadelphia was formed. The association at present is only a temporary one, but steps will be taken to make it permanent. To that end the following officers were chosen: President, Fred R. Elston; vice-president, Leland S. Hennold, and secretary and treasurer, Samuel G. Flamm. These three officers, together with E. V. Kemmerer, were named as a committee to canvass the cyclecar trade and secure signatures for charter members of a permanent organization.

The objects of the association are not only to push sales of machines but also to promote races, runs and other contests during the outdoor season and to hold an indoor show in the winter. The association will seek affiliation with the National Cyclecar Assn.

Cyclecars Tuned for New England Run

BOSTON, MASS., May 25—The first cyclecar run ever held in the east will take place next Saturday. It will cover two days. The machines will start from the Hotel Oxford on Huntington avenue at 9 o'clock and go by way of South Framingham and Marlboro to Worcester where there will be noon control for luncheon.

After one hour spent there the trip will be continued by way of the Brookfields to Palmer and Springfield, the night control. This will be a distance of about 100 miles. At Springfield there is to be a banquet in the evening and the machines will be exhibited at one of the hotels.

Sunday morning the run back to Boston will start at 9.15. The cars will cover a different route going by way of Leominster to Fitchburg, the noon control. After luncheon there the trip will be resumed for Boston where the time limit will compel checking in before 7.

President E. A. Blake of the New England Cyclecar Assn. will direct the run with the assistance of officials from among the members. There will be no attempt at speeding, the purpose being to show how economical the little machines can make the trip which will be about 200 miles.

Packard Men in New Repair Firm

NEW YORK CITY, May 20—C. M. Doty, who has been with the Packard Motor Car Co., New York City, for the past 10 years, will resign from that company June 1, to become president of the Doty-Demos Co., Inc., 621 West Forty-second street, New York City. This company was organized recently to do a general repair and used car business, specializing in Packard cars. Doty has been manager of the technical department of the Packard company in New York. Demos was foreman of the Packard repair shop in New York for several years.

Automobile Races on Staten Island May 30

NEW YORK CITY, May 22—The United Automobile Racing Assn. will hold an automobile race meet at the Staten Island Fair Grounds May 30. M. H. Hickman and John De Palma will be seen at the meet.

Louisville Co. To Manufacture Starters

LOUISVILLE, KY., May 21—With a capital of $350,000, a company to be known as the Sampson Engineering Co., has been formed in this city to manufacture an improved electrical starter for automobiles. B. B. McGraw, D. A. Caldwell and N. H. Wright are the incorporators. The company will lease a floor in the Snead Architectural Bldg. for its present purposes.

The appliance it will manufacture is the invention of James Delano, of Indianapolis, who will be an officer of the company.

Deputies To Pass on Workingmen's Injuries

NEW YORK CITY, May 25—The State Workingmen's Compensation Commission has selected ten deputies. Each of the deputies is to receive $4,000 a year and expenses. They are to be assigned by the central board to hear disputes as to injuries to employees and report to that board evidence and recommendations. The board finally determines what insurance shall be paid employees who suffer injury.

Prest-O-Lite Re-Hearing Petition Overruled

CHICAGO, ILL., May 27—*Special Telegram*—A petition for a re-hearing in the suit of the Prest-O-Lite Co. against the Searchlight Gas Co., of this city, was overruled by the U. S. Circuit Court of Appeals, Judges Baker, Seaman and Sanborn sitting. In a decision rendered recently the Searchlight company was prevented by the court from re-filling Prest-O-Lite acetylene lighting tanks, the decision coming after about 3 years of litigation.

Philippine Trade Flourishes—U. S. March Imports. $55,736

Hawaii and Porto Rico Shipments Indicate Decline in Popularity of American Cars, However

WASHINGTON, D. C., May 25—Of the non-contiguous territories of the United States the Philippine Islands are the ones showing the greatest gains in the imports of American motor cars, according to figures made public today by the federal bureau of statistics. During March last sixty-five cars were shipped to the Philippines, the value being $55,736, while in March a year ago the number was seventeen and the value $23,862. During the 9 months ending March, the number of cars shipped there from this country was 345 valued at $413,840 in 1913, and 518 valued at $614,679 in 1914. Shipments of parts, except engines and tires, decreased in value from $15,122 in March, 1913, to $9,673 in March last, but increased from $40,458 to $58,171 during the 9 months' period.

There were three cars shipped to Alaska in March last, the value of which was $2,875. None were shipped in March a year ago. During the 9 months' period the number increased from five valued at $8,050 in 1913 to 24 valued at $22,008 in 1914.

The receipts of cars from the United States into Hawaii during March, 1913, was fifty-five valued at $90,972, while in March last the number was eighty-one, but the value was only $77,179. During the 9 months' period the number decreased from 535, valued at $891,538 in 1913, to 506 valued at $652,781 in 1914.

Porto Rico took twenty-two cars valued at $33,106 in March, 1913, and twenty-one valued at $16,761 in March last, while the number during the 9 months' period decreased from 267 valued at $330,322 in 1913, to 223 valued at $255,555 in 1914.

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Makes Bid to Supply War Trucks

WASHINGTON, D. C., May 25—Simultaneously today, under authority of the secretary of war, bids were opened by depot quartermasters in this city, El Paso, Tex., Fort Sam Houston, Tex., Chicago and St. Louis, for furnishing seventeen motor truck chassis. The bids received in this city were as follows:

Thomas B. Jeffery Co., Kenosha, Wis., $2,300 each, delivery within 40 days at Kenosha; Velie Motor Vehicle Co., Moline, Ill., $2,022 delivered at Moline, $2,074 delivered in New York, $2,112 delivered in El Paso, deliveries within 44 days; Federal Sales & Service Co., Washington, $2,200, delivery at Detroit within 60 days; Bessemer Motor Truck Co., Grove City, Pa., $2,265 with delivery at New York, $2.290 with delivery at El Paso, deliveries within 90 days; Driggs Seabury Ordnance Co., Sharon, Pa., $2,440, delivery at Washington or New York, four within 3 weeks and four per week thereafter; Lord Baltimore Truck Co., Washington, $2,500, delivery at Washington within 90 days; Kelly-Springfield Motor Truck Co., $2,400, delivery at Springfield, O., four in 7 days, eight in 14 days, five in 21 days. It is understood early deliveries will be considered in awarding contracts.

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Iowa Sales Now 400 Cars a Day

DES MOINES, IA., May 22—Iowa now is buying 400 new automobiles every day. The records in the office of the secretary of state show that 80 per cent. of the cars now being registered are new ones and that the average registration for each day is 500. This makes 400 new cars a day for the state. The general word among the distributers is that they cannot supply the demand.

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M. T. C. Hears of Dock Congestion

NEW YORK CITY, May 20—Motor Trucks and the New York Dock Problem were the subjects of discussion at the Automobile Club of America tonight. The meeting was addressed by Dock Commissioner R. A. C. Smith; J. K. Orr, president of the New York Team Owners' Assn., and Willard C. Brinton, an engineer whose experience with this problem has been very extensive.

Mr. Brinton presented a series of stereopticon slides showing the conditions and facilities at several of the greatest ports. His talk was extemporaneous and explanatory of the pictures.

Mr. Orr presented a résumé of the hearing of the New York Team Owners' Assn. before the Interstate Commerce Commission, the object being to obtain improved conditions at the different freight terminals throughout the city.

Commissioner Smith offered to appoint a committee to confer with a committee appointed by the Motor Truck Club on plans for the relief of the present congested conditions of the New York freight terminals.

The next meeting of the club will be held on June 17 at the Automobile Club of America, the subject being Garages and Shops.

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Knutson Spring Starter Being Made

GALESBURG, ILL., May 22—The Automatic Devices Co., owner of the patents of the Knutson automatic engine starter, especially for use on automobiles, has closed a contract with the Frost Mfg. Co. for the manufacture of 6,000 Knutson starters in sizes to fit automobiles of every make. The Knutson starter is a device operated by a spiral spring inclosed in a casing. It is attached to a car by bolting on a supporting brace directly in front of the radiator. By pressing a small button located on the footboard, a spring is released, thus starting the engine. The spring immediately rewinds and locks itself so that it is ready for another start. The device is offered in two types, one for Ford cars and one for all other kinds. The starter sells for $75 and $85. The directors of the company are: F. N. Clark, E. P. Robson, C. F. Hurburgh, A. W. Knutson and others. The officers are: F. N. Clark, president; R. C. Wharff, vice-president; E. P. Robson, secretary, and E. M. Wharff, treasurer.

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New Allen Light Car Has Double Belt

NEW YORK CITY, May 22—The Allen Iron & Steel Co., Philadelphia, Pa., will this year build a light car to sell at $450. It has a four-cylinder, water-cooled, 20-horsepower motor, friction transmission, double-belt drive, and electric lighting with storage battery and generator. The wheelbase is 108 inches and tread 44 inches. The bore and stroke of the motor are each 3 inches. Ignition is by high-tension magneto and circulation of the water through the jackets and radiator is by thermo-syphon currents. From the motor, the drive is by shaft to the transmission located well back, partly under the seat. Two semi-elliptic springs are used at the front, shackled in the usual manner, and at the rear, two semi-elliptic springs are held in the cantilever style of suspension.

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S. A. E. Issues Standards Booklet

NEW YORK CITY, May 22—In connection with the membership campaign the Society of Automobile Engineers has issued a booklet on S. A. E. standards giving actual comments by practical engineers on what the standards adopted by the S. A. E. have saved for them in actual money.

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Takes Over Eclipse Spring Shock Absorbers

SYRACUSE, N. Y., May 22—The Brown Co., this city, manufacturer of the Impulse tire pumps, gauges, etc., has purchased that branch of the Automatic Machinery Co., Canisteo, N. Y., formerly the Thomas Auxiliary Spring Co., appertaining to the manufacturing and selling of Eclipse spring shock absorbers especially adapted to Ford cars. The retail price of four of these springs, two for front and two for rear, is $10.

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Premier 6-49 Announced for 1915

NEW YORK CITY, May 22—The Premier Motor Mfg. Co., Indianapolis, Ind., has announced a 6-49, to distinguish it from the previous 6-48. The new car is a roadster and will sell for $2,385, the former price being $2,775. The new line is designated as a 1915 model. It has streamline body, wire wheels, long semi-elliptic springs, and left-hand steering.

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Gasoline Off 1-2 Cent in Milwaukee

MILWAUKEE, WIS., May 22—So-called 60 test gasoline is now selling in Milwaukee at 12½ cents in tank wagon delivery, a reduction of ½ cent since May 1. Other grades remain stationary, as follows: 65 test, 15 cents; 70 test, 17 cents; 72 test, 19 cents.

The Engineering Digest

The Charge Against Cantilever Springs, That They Must Be Heavier Than Semi-Elliptics, Proved False

AN ACADEMIC MISTAKE NOT SHARED BY BUILDERS

SINCE the socalled cantilever springs were introduced, whose design is in no sense parallel with that of cantilever bridges except in so far as the load is supported at the end of a freely projecting portion of the structure, theoretical commentators have shown an inclination to figure upon the strength of their construction as if they were dealing with the strength of a rigid beam subject to static stresses only, and on this basis they have come to the conclusion that a cantilever spring should be twice as heavy as a semi-elliptic spring designed for the same vehicle loads, because the stresses at the middle of the cantilever spring—if its arms are of equal length—are twice as great as those at the middle of the semi-elliptic spring for the same loads; as they clearly are, on the ordinary principles of leverage.

Manufacturers, however, who have fitted cantilever springs to their cars have shown no sign of recognizing the demand for double strength and weight. On the contrary, the cantilever springs in actual use seem to be quite as slender as the semi-elliptic springs which they replaced. On the other hand, the advantages of the cantilever springs are strongly emphasized; namely, that the vehicle wheels can get over a given road obstacle with only one-half of the spring compression necessary with ordinary springs, because the deflection, with the cantilever spring, is transformed into one motion at the end where it is attached to the axle, while with ordinary springs the axle lift can be no greater than the deflection at one end of the spring, the deflection at the other end merely duplicating the required movement. The wheel being enabled to get over road inequalities with less flexion of the spring, it also gets back against the road with less force, and reduced tire wear as well as less lift of the vehicle body should be the result. [But this claim is open to argument when it is admitted that the intrinsic flexibility of the cantilever spring is only one-half of that of the semi-elliptic.—ED.]. The other advantage dwelt upon is that any given axle lift, aside from bending the spring only half as much as in the case of an ordinary spring, also has no tendency to lift the vehicle body more than one-half of the axle lift, while with ordinary springs the corresponding tendency is to lift the vehicle body the entire height of the axle lift. The actual reciprocation between axle and body is therefore reduced, and the advantage gained on this score is felt in practice especially when the vehicle is underloaded, so that the body follows the axle more than it ordinarily should.

If it were necessary to make the cantilever spring heavier —twice as heavy as a corresponding semi-elliptic spring— most of these advantages would be lost or would be accompanied by the more important disadvantages arising from making the spring, both the fixed and the free end, longer.

Subject Analyzed

A writer in *Auto-Technik* treats the subject of the required weight and strength of cantilever springs in the manner set forth in the following:

When the demand for flexibility of the spring suspension is the same for cantilever springs, of the general type shown in Fig. 1, as for the ordinary springs and the weight of the unsuspended mass is also the same, the following factors must be alike: (a) the maximum axle movement and (b) the axle lift caused at a given vehicle speed by shock against a road obstacle of given form and size. This axle lift is determined by the fact that a given shock acting with a given unsuspended mass always must store the same amount of work in the spring and must therefore bend and deflect it alike. The question under contention is now: Is a much stronger spring required with cantilever construction in order to store a given amount of work than with ordinary springs? The accepted theory of spring action answers briefly and clearly: With the same spring material and the same bending stress applied to this material, the amount of work stored in a spring by its flexion is proportionate to its volume; that is, to its weight. Obversely, in order to absorb a given amount of work from the unsuspended mass the same weight of spring is always required.

Graphic Comparison

If this inference from the laws of spring action is not considered convincing, it can be shown that the same answer is reached by a more detailed examination of the factors involved.

Let the ordinary semi-elliptic spring, Fig. 2, be supposed to have been cut in two in the middle and each half clipped separately to the spring plate. Aside from the need of four clips, no new condition has been created by this arrangement. A given shock bends both halves, producing the deflection a, for example, and the load at the end of each half thereby rises from P_o to P, Fig. 4. The increase of load takes place in the same proportion as the deflections, throughout the range from the static load P_o and the static deflection corresponding to it to the working load P and the total deflection caused by it, which is $a_o + a$, the line of increase following a straight line, as in the diagram. Each half of the spring absorbs thereby the work $\frac{P - P_o}{2} \times a$, which corresponds to the area of the hatched triangle, and the work stored in the whole spring is of course twice as great, or $(P - P_o) \times a$.

According to the assumption of equal working-flexibility for the two springs, the vertical displacement of the axle should now be the same with the cantilever spring for the same amount of work stored.

It is observed that with the cantilever spring the deflection a of the projecting spring portion causes a doubled lift of the axle, as the spring plate does not maintain its position parallel with the vehicle frame but turns until the other half of the spring has also undergone a deflection equal to a. [The complications entering at this point through the constraining action of the shackle, probably causing the flexion of this half of the cantilever spring to follow a different curve from that followed by the free half, have not yet been interpreted mechanically by any of the writers on the subject and are also in this case ignored. The deflection is to be measured on both sides, however, from the spring ends to the base line drawn as a prolongation to both sides of the pivoted spring plate.—ED.]. By this turning of the spring plate the axle lift is of course doubled. To effect a given axle lift a, there is thus needed only the deflection $a/2$ for each half of the

spring. The factor $P - P_o$ in the above-mentioned product can thus be twice as great as for ordinary springs, to offset the reduction of the other factor from a to $a/2$. As now in Fig. 3 the value $2P_o$ anyway takes the place of P_o in Fig. 2, the value of P_1 must also here become $2P_1$, so that the product, representing the total of work stored, may remain the same; that is, the spring in Fig. 3 is, to be sure, loaded twice as heavily as that in Fig. 2, but it is only required to be bent one-half as much in order to afford the same play for the axle. The load, and therefore also the bending stresses are thus in both cases increased in the same proportion; namely from P_o to P in Fig. 2 and from $2P_o$ to 2P in Fig. 3.

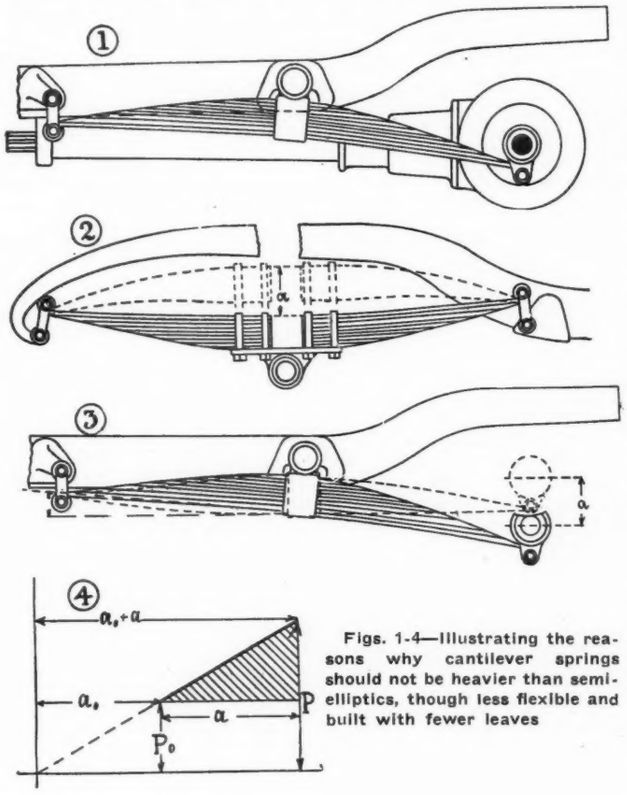
This equal increase in bending stress for one-half of the deflection is tantamount to the requirement that the spring, for cantilever construction shall be designed to give only one-half of the deflection for a given load that the semi-elliptic spring gives; its specific deflection—meaning its flexibility as a spring, apart from its working-flexibility with relation to the vehicle frame, which is measured by the axle lift—shall be one-half of that of the semi-elliptic. Such a spring must have the same volume and weight as a semi-elliptic spring for the same static axle load, for it takes the load $2P_o$, rising to 2P, with a deflection of $a_o/2$, rising to $a_o/2 + a/2$ and consequently stores the same work as the semi-elliptic.

The argument in this manner therefore leads to the same conclusion as that based directly upon the general law for spring action. The weight of spring required is the same with cantilever construction as for ordinary springs.

Fewer and Thicker Leaves Wanted

When the proper design for a cantilever spring is calculated with reference to the requirements that its specific flexibility shall be one-half of that of the semi-elliptic while the fiber stresses shall be no greater and the utilization of material equal, it is found that a spring with thicker and fewer leaves is wanted.

In the case of those vehicle designs in which the driving-thrust is transmitted through the springs, an advantage for the cantilever spring arises here through the greater rigidity of the main leaf which acts as a strut, and it need only be mentioned that a spring with few and thick leaves naturally is cheaper to make than one with many and thin ones. That the friction among the leaves in such a spring is smaller than in ordinary springs may or may not be an advantage. As shown by Dr. Bobeth, the spring-damping elements produced by other means than by friction among the spring leaves are more important than this friction, and this point may therefore be left in abeyance.



Figs. 1-4—Illustrating the reasons why cantilever springs should not be heavier than semi-elliptics, though less flexible and built with fewer leaves

Unsuspended Mass Reduced

In the foregoing it has been assumed for purposes of comparison that the unsuspended masses are equal in the old and the new designs, but in reality they are considerably smaller with the latter, the difference amounting to 10 to 20 per cent., owing to the main bulk of the cantilever spring being pivoted to the vehicle frame and participating only in very much reduced measure in the axle movements.

The inertia to be absorbed in the springs is therefore correspondingly smaller, and the cantilever spring could for this reason be made even somewhat lighter than the semi-elliptic.

On the other hand, the increased pressures in the bearings and at the fastening of the main pivot pin in the vehicle frame are beyond dispute and have to be provided for. So far as the frame is concerned, this may be done by a very slight increase in the vertical dimensions of the frame reaches. With regard to the bearings, the doubled stresses are offset in part by the smaller angle of rotation on the pins which results from the small deflections of the cantilever spring and which means reduced frictional work—smaller than would arise from doubled pressures in ordinary springs. A searching examination on this point would perhaps yield interesting conclusions.

Bicycle Specially Designed as an Accessory for Cars

IN the measure as the public demand for having the running board of automobiles cleared of regular encumbrances, such as tires, batteries, tool boxes and gas tanks, is meeting with response among manufacturers, the possibility of utilizing the outboard space for occasional requirements, rather than marring its appearance for every-day use of the vehicle, is being looked upon with more favor. Emergency seats for the running-board are already common, and now the old-time suggestion of placing a bicycle there has been taken up with a view to the great convenience it may afford tourists for making small individual excursions from the main route for one purpose or for another. As the ordinary bicycle has too many projecting parts for lying nicely against the side of a car, a French firm, the Saint Etienne Arms company, has devised a special design which meets the wants of motor tourists as well as those of persons who must store their bicycle at home as snugly and inconspicuously as possible. This model is not a folding bicycle, since the folding type has never become popular, not even for military work. The provisions by which it becomes possible to make a very flat package of it are the following only: The handlebar is in two parts, of a model once very common, and when both bars are turned down (and the front wheel reversed in the steering post) they hug the upper tube of the frame closely; an automatic push-button lock secures them in any position given them; the pedals can be turned 180 degrees around, so as to point toward the frame, and an automatic locking device takes care of their position, either way; the clip securing the saddle is easily loosened and the saddle is hung within the diamond frame when the bicycle is carried; finally, the rake of the front fork is made so as to allow the front wheel to be turned completely around, as in trick bicycles, and this shortens the space occupied by several inches.—From *Omnia*, May 9.

Valves-in-Head Predominate in Racers

(*Continued from page* 1135)

streamline idea was carried out very thoroughly, the body being made by William Woop, New York, whose son Charles Woop is Chandler's mechanic on his car. Young Woop was so anxious that the car would make a good appearance upon its arrival at the speedway that he spent the entire time of the journey from New York in the express car painting his pet. Both cowl and back are so high that the car could turn over completely without injuring the driver or mechanic. The springs are very flat semi-elliptics and pistons and connecting-rods are very light. Cable brakes are used, the transmission is a Brown-Lipe and the axle is a Timken. Chandler carries 40 gallons of gasoline and 15 gallons of oil, sufficient to carry him 400 miles. The car, though it looks speedy, will probably not be driven to the limit, as it is the intention of the Braender tire people to repeat on Mulford's record of last year of running the entire 500 miles on one set of Braenders, a triumph that probably would be worth more to them than winning first place.

Ray Is a Composite Car

This car consists of a Mercer chassis with a Wisconsin motor of 5 by 5 1-2-inch bore and stroke with T-head cylinders, cast in pairs. The magneto is a Mea with a double distributer and feeds eight spark plugs. The valves have a 9-16-inch lift and are 3 inches in diameter. The Ray wheelbase is 108 inches and the gear ratio is undecided at this time.

Great Westerns Have Piston Valve Motors

The three Great Westerns which have just arrived at Indianapolis are featured by the Carter piston valve motors. Two of the Great Westerns have the same dimensions, 4.2 by 8 inches bore and stroke, while the third has a 3.7 by 5.7 inch motor.

Stafford Is a Small Car

One of the small cars in the race is the Stafford to be driven by Callahan, and with its bore and stroke of 4.2 by 5.1 shows a displacement of only 290.7 cubic inches. This motor, a four-cylinder one, is cast in pairs, and has valves set at an angle of 30 degrees on each side. The water pump is in the rear of the overhead camshaft, which is driven by a silent chain, which also drives the magneto. As in the Keeton, the steering wheel of this car is braced. The wheelbase is 111 inches.

Gray Fox Remains Unchanged

The Gray Fox which did creditable work in last year's 500-mile race and which is to be driven by Wilcox has a four-cylinder 5 by 5 1-2-inch valve in the head motor. A Bosch double distributor magneto will be used and also a Rayfield carbureter. The wheelbase is 96 inches and the gear ratio is 2.31 to 1.

Metropol Has Long Stroke Motor

Horan's Metropol, which hails from Port Jefferson, L. I., has a four-cylinder T-head, block motor of 4.2 by 7.1 inches bore and stroke and is equipped with an H. & N. carbureter which has two gasoline lines leading to it. Very little attempt has been made at streamlining the car. The wheelbase is 110 inches.

Shambaugh Has Two Exhaust Valves

The Shambaugh, the unknown entry, has a four-cylinder motor with two exhaust valves and one inlet valve per cylinder. These valves are located in the head and are operated by vertical push rods. The spark plugs are set horizontally in the side of the cylinder and are operated by a single system, Bosch magneto. A feature of the Shambaugh is the oiling system. After the oil has been circulated through the motor it is sent out into what may be called an oil radiator. This radiator consists of a coil of copper tubing placed directly behind the ordinary water radiator. The draft of air rushing through cools the copper tubing and hence the oil therein which is on its return passage to the motor crankcase. The cylinders are cast in pairs and each pair has a large copper waterjacket around it.

Isotta Has Been Altered

Gilhooley's Isotta is the same one that Tetzlaff drove last year, but it has had a number of alterations, the most noticeable of which is the streamlining of the body. There are two exhausts and two inlet valves in each cylinder, operated by a camshaft above the cylinder heads. Pistons are of pressed steel and are very light. The motor is a four-cylinder block casting and the combustion space is nearly hemispherical and the valves are inclined slightly outward. Immediately above the camshaft is the hollow shaft carrying 16 rocker arms for operating the valves. The whole mechanism is inclosed by an aluminum plate and pressure oil feed is used direct through the hollow rocker arm shaft and thus to the rocker arm. The camshaft runs in an oil level supplied by the rocker arm shaft. The connecting rods are tubular. The car is fitted with two sets of brakes, all internal, and one set on the front wheels connected up with the emergency brake lever and the other on the rear wheels connected with the pedal. The expanders are faced with cast iron.

Beaver a Speedway Special

The Beaver Bullet is a special racing car built by Charles L. Rogers and Charles F. Keene. It is original in design and is especially for use on the Indianapolis Speedway. The motor is of the four-cylinder T-head type, the cylinders cast in pairs. The piston displacement is 449.4 cubic inches, the valves 3 inches in diameter and the exhaust line 4 inches. The wheelbase is 101 inches and Dunlop wire wheels and Bosch two-point ignition is used. The oil tank is carried under the frame lengthwise of the right frame member. A shield is provided for the driver like that on the Keeton. A streamline effect is gained in the front by a pointed nose and a tapered hood. S. R. O. bearings are used throughout.

Pope Bullet Has Valves in Head

Mort. Roberts, who will drive the Pope Bullet, will handle a four-cylinder 4.7 by 5.7-inch motor with the valves set in the head. These valves have a diameter of 2 1-8 inches and a lift of 9-16 inch. A double distributer Bosch magneto and a Rayfield carbureter will be used. The Pope Bullet has an unusually long wheelbase as compared with the other cars, it being 124 inches. There are two valves per cylinder and the spark plugs are set at an angle.

Texas Valves Have ¾-Inch Lift

The Texas, which hails from Fort Worth and is to be driven by George Clark, is said to have made 105 miles an hour in practice. The cylinder dimensions are 5.1 by 5.5 with 3-inch valves and 3-4-inch lift. The magneto is a Bosch with two distributers and the carbureter is a Rayfield. The car has a 100-inch wheelbase, 2 1-3 to 1 gear ratio and carries 35 gallons of gasoline and 15 gallons of oil, the latter being sufficient to last throughout the entire race, Clark believes. At present wire wheels and Miller tires 35 by 5 will be used all around, but this equipment has not been definitely decided upon.

Factory Miscellany

KEROSENE Engine Co.'s Plans—The Kerosene Power Co., Minneapolis, Minn., manufacturing a line of kerosene engines of the stationary and marine type, and now developing a kerosene motor suitable for commercial cars, has made a proposition to the Commercial Club of Beaver Dam, Wis., to relocate its plant if suitable manufacturing quarters are provided and Beaver Dam capital can be induced to take a small block of stock. The proposition is receiving serious consideration, inasmuch as there is a suitable factory now idle and on the market. A campaign is under way to secure subscriptions to $30,000 worth of the stock. The Minneapolis corporation is capitalized at $100,000.

Delaunty May Locate in Kenosha—The Industrial Association, Kenosha, Wis., is negotiating with the Delaunty Engine Co., Chicago, Ill., to build a new plant for the manufacture of a new type of automobile engine.

Aluminum Goods Co. Adds—The Aluminum Goods Mfg. Co., Manitowoc, Wis., has closed a deal for the purchase of four large lots adjoining its plant and will build a large manufacturing and storage addition. The force of 750 will be increased to 1,000.

"Six" Capacity Doubled—By an ingenious rearrangement of the block test room, Studebaker efficiency engineers have doubled its capacity to turn out motors for the Studebaker "Six." This room now has stands for seventy-five motors, each of which receives a run of six hours.

Standard Oil Doubles Capacity—The Standard Oil Co. is preparing to double the capacity of its storage tank system for the Milwaukee district, located west of the Milwaukee city limits between West Allis and Wauwatosa suburbs. Two 10,000-gallon tanks will be erected immediately, giving the plant a total capacity of 40,000 gallons of gasoline. Helmuth E. Boettcher is manager.

Wilson Plant Started—Construction work on the proposed factory for the Wilson Tire & Rubber Co. at Springfield, O., started May 10 at a site in Harvard Park. The plant will be completed in four months and is expected to begin operating at that time with 250 men. E. Warren Wilson, president of the company, and the inventor of the patent automobile tire which will be manufactured, and Theophile Reuther, a director of the corporation, have charge of construction.

J. I. C. Co. Accepts Workmen's Compensation—The J. I. Case T. M. Co., Racine, Wis., employing in excess of 5,000 men in Wisconsin, has elected to come under the provisions of the Wisconsin workmen's compensation act or industrial insurance law. The Case company is one of the few large industrial concerns in Wisconsin which did not accept the act last year. Under the law workmen are assured stated benefits and damages for accidents and deaths. All lawsuits are avoided.

Besserdich May Build Truck—William Besserdich, designer of the Four-Wheel drive motor truck, and one of the founders of the Four Wheel Drive Auto Co., Clintonville, Wis., has disposed of his interest in the concern, and it is said he is now negotiating with Pacific Coast capital to establish a works for the manufacture of a new four-wheel-drive car in which the power is applied direct to each wheel instead of by the double propeller shaft and differential system of the present Four Wheel Drive car. Mr. Besserdich has established a small experimental shop in Clintonville and will take the truck to California as soon as the model is completed.

Commerce Factory Has Narrow Escape—The Commerce M. C. Co., Detroit, on Friday had a narrow escape from the explosion which made a total wreck of the adjoining plant of the Mexican Crude Rubber Co. While the explosion was terrific, demolishing the heavy machinery and killing ten men with scores of wounded, the only damage suffered by the Commerce factory was the loss of thousands of small window-panes. Several of the men at work assembling the delivery cars were blown over in a shower of glass. G. B. Wilcox, the sales manager, reports production as unhampered.

Fabric Mills Working—The installation of machinery at the plant of the Canadian Connecticut Cotton Co., Sherbrooke, Que., is reported to be proceeding satisfactorily and the mills have already started to manufacture fabric. Some delay has been experienced in getting the spinning machinery into place, due mainly to the fact that shipments of the machinery from England were hindered by labor troubles. Some difficulty was also encountered in getting the requisite native labor for the mills, but that difficulty now appears to be overcome. The looms in place are being broken in gradually, and it is anticipated that by the middle of June the plant will be running at full capacity. The output of the mills has been sold in advance for some time ahead.

The Automobile Calendar

May 27-28	Washington, D. C., National Trade Convention, American Mfgs.' Export Assn.
May 28-30	Chambersburg, Pa., Trys over Lincoln Way from Chambersburg to Pittsburgh, Chambersburg Motor Club.
May 30	Newark, N. J., Cyclecar Run, Newark Cyclecar Club.
May 30	Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
May 30	New York City Track Meet at Brighton Beach.
May 30-31	Boston, Mass., N. E. Cyclecar Assn., Run through Mass.
June 1	Brooklands Track, England; Annual Automobile Race; Royal Automobile Club of Great Britain and Ireland.
June 1	Palermo, Sicily, Coupe Florio, 279-Mile Race.
June 9	Cleveland, O., Annual Meeting Cleveland Engineering Society.
June 10	Isle of Man; Tourist Trophy Race; Royal Automobile Club of Great Britain and Ireland.
June 12-13	Chicago, Ill., Seventh Annual Reliability Run to Peoria and return; Chicago A. A. and Chicago A. C.
June 15	Savannah, Ga., Run, Savannah Auto Club.
June 17-18	Fayette Co., Pa., Second Annual Hill Climb, National Pike.
June 18	Uniontown, Pa., Hill Climb, Auto Club of Fayette Co.
June 20	Milwaukee, Wis., Competition Run between Milwaukee Athletic Club and Milwaukee Automobile Club.
June 23-26	S. A. E. Summer Meeting, Cape May, N. J., Cape May Hotel.
June 24-26	Chicago, Ill., Seventh Annual Meeting of Nat. Gas Engine Assn.
June 27	Brooklands Track, England; Annual Automobile Race.
June 27-July 4	A. A. A. Touring Week.
June 29-July 2	Chicago to Boston National A. A. A. Reliability Tour.
June 30	London, Eng., Fourth International Rubber and Allied Industries Congress.
July 2	Targo-Florio Cup Road Race, Madonic Circuit, Italy.
July 3-4	Tacoma, Wash., Montamara Festo Races, Tacoma Speedway Assn.
July 4	Sioux City, Iowa, 300-Mile Race, Sioux City Auto Club and Speedway Assn.
July 4	Lyons, France, French Grand Prix.
July 13-14	Seattle, Wash., Track Races, Seattle Speedway Assn.
July 25-26	Belgium Grand Prix Road Races.
Aug. 21-22	Chicago, Ill., Elgin Road Races, Chicago Automobile Club.
Aug. 23	Auvergne, France, Coupe de l'Auto Race.
Aug. 27	Brooklands Track, England; Annual Automobile Race.
Sept. 9	Corona, Cal., Road Race, Corona Auto Assn.
Sept. 26	Brooklands Track, England, Annual Automobile Race.
Sept. 26-Oct. 6	Berlin, Germany, Automobile Show.
Oct.	Philadelphia, Pa., E. V. A. A. Annual Convention.
Oct. 9-Nov. 2	S. A. E. Europe Trip.
Oct. 16-26	Paris, France, Automobile Salon.
Oct. 17-24	Pittsburgh, Pa., Automobile Show, Auto Dealers Assn., Inc.
Oct. 19, 20, 21	Philadelphia, Pa., Elec. Veh. Assn's Convention.
Oct. 19-26	Atlanta, Ga., American Road Congress of the American Highway Assn. and the A. A. A.
Nov. 6-14	London, England; Olympia Show.

The Week in the Industry

Motor Men in New Roles

CASE Abbott Advertising Manager—Julius M. Case has been appointed manager of advertising and sales promotion by the Abbot M. C. Co., Detroit, Mich. Mr. Case has already taken up his work with the Abbott company after resigning from a similar position at the Regal M. C. Co., with which concern he has been identified for some time. The plans of the Abbott M. C. Co., which are already under way, embrace not only an advertising campaign of national scope but the inauguration of a sales promotion department.

Ralph Ketchum Resigns—Ralph Ketchum, manager of the New England branch of the Kisselkar company at Boston, has resigned and he has been succeeded by G. H. Lawrence, his assistant.

In New Capacity—V. S. Montcrieff, formerly connected with the Packard Motor Car Co. and the Overland Automobile Co., was recently appointed chief engineer of the Partin Manufacturing Co., Detroit, Mich.

Henderson Joins His Brother—R. P. Henderson, who has recently had charge of the active management of the Henderson M. C. Co., Indianapolis, Ind., is preparing to join his brother, C. P. Henderson, who is vice-president of the Regal M. C. Co., Detroit, Mich.

Dr. Percival Appointed Chairman—Dr. Chas. G. Percival, of Teaneck, N. J., president of the Cyclecar Club of New Jersey, has been appointed chairman of the National Touring Committee of the Cyclecar Assn. of America by President C. P. Root of that association.

Franklin with Locomobile—E. L. Franklin, for the past three years head salesman of the Brooklyn branch of the A. Elliott Ranney Co., is now connected with the New York branch of the Locomobile Co. of America as assistant to J. A. Mellish, manager, exchange car department.

Peden Dies—Charles L. Peden, architect for the Buick Motor Co., and supervising constructor for the General Motor Co., who designed and supervised the construction of buildings in Chicago, Pittsburgh and Albany, died last week of a complication of diseases at his home, No. 603 Hancock street, Brooklyn. He was 48 years old and leaves his wife and one son.

Klumb Heads Wisconsin Oil—The Wisconsin Oil & Supply Co., Milwaukee, Wis., organized recently with $15,000 capital, has established headquarters and tanks at 2609-2611 Elm street and is marketing oils and greases under the trade name of Wosco. P. J. Klumb has been elected president. C. Weckmueller vice-president and H. H. Gerlach secretary and treasurer.

Rogers with Russell Co.—J. E. Rogers, until recently assistant general sales manager of the National Cash Register Co., Dayton, O., has joined the Russell M. C. Co., Toronto, Ont., as assistant general manager. Mr. Rogers will also be elected to the directorship made vacant recently by the death of the late Senator Cox, and become second vice-president of the company.

Bennett Joins Westcott—A. L. Bennett, for the past four years Eastern district sales manager for the Abbott Motor Co., will henceforth supervise the same territory for the Westcott M. C. Co., Richmond, Ind., with whom he was formerly connected. Mr. Bennett will make his headquarters with the new Metropolitan distributor for the Westcott cars, C. B. Derby & Co., 1862 Broadway, New York City.

Ruprecht with Brady-Murray—Louis Ruprecht, district manager of the General Vehicle Co., Inc., Long Island City, N. Y., has resigned his position in order to assume his new duties on June 1 as manager of the Brady-Murray Motors Corp., distributor of the Chandler light six, with headquarters in New York City and branches in Brooklyn, Hartford, Newburg, Newark, Plainfield, etc.

Smith Joins Graham Co.—H. F. Smith, former manager of the top and trimming department of the Kissel Motor Car Co. at Hartford, Wis., has joined with D. A. Graham, of Fond du Lac, Wis., in the organization of the Northern Awning & Tent Co., which is now establishing a factory in Green Bay. Headquarters are in the Duchateau Building at 524-526 Main street, which is being equipped for the manufacture of motor car and boat tops and cushions, tents, awnings, etc. Mr. Graham formerly was head of an awning and tent company at Fond du Lac.

Oakes Off for Europe June 8—Warren D. Oakes, president of the Oakes Co., Indianapolis, Ind., manufacturer of radiator fans and automobile parts in pressed steel, sails for Europe June 8. While abroad Mr. Oakes will call on the principal manufacturers in Great Britain and continental Europe with a view of opening up business relations for his company. Tom O. Jones, advertising manager of the Marion Car Co., Indianapolis has resigned and accepted the appointment of advertising and export manager for the Empire Automobile Co., Indianapolis, Harlow Hyde, formerly advertising manager of the Bosch Magneto Co. and latterly filling a similar position with the Empire Automobile Co., Indianapolis, has resigned. While Mr. Hyde has had several offers from other automobile companies he has not yet accepted any proposition, but it is likely that he will join the forces of some other Indianapolis concern.

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Garage and Dealers' Field

Houk's N. Y. Retail Store—The Houk Wire Wheel Co., of which J. Ed. De Mar is the manager, will in a day or so open a retail store at the corner of Fifty-eighth street and Broadway, New York City.

First Truck Exhibit at Exposition—The Moreland Motor Truck Co., Los Angeles, Cal., has signed for a large floor space to exhibit their trucks at the Panama-Pacific Exposition. This is the first truck manufacturer to take space in the World's Fair in 1915.

Mercers for N. J. Inspectors—The New Jersey motor vehicle department has purchased two Mercer raceabouts, one to be used around Atlantic City and the other in the vicinity of Asbury Park. The speed of these cars is guaranteed at least 1 mile in 51 seconds.

Adams' New Traffic Signal—E. S. Adams, at the head of the E. S. Adams Co., Columbus, O., has placed on the market a traffic signal to be attached to the windshield of automobiles to enable the drivers to signal the way a turn is to be made. The signal is raised and locked by one operation and is said to be quite simple.

New Road Record Established—A new road record from Vancouver, B. C., to Seattle was established last week when Harry Welch drove a six-cylinder Chalmers touring car from Vancouver to Seattle in 7 hours and 28 minutes. The distance over the Pacific Highway is 172 miles, and the driver went out of his way 3 miles in making the run.

Palmer-Moore's Large Order—The Palmer-Moore Co., Syracuse, N. Y., has been awarded an order for twenty motor trucks by the Clearing House Parcel Delivery Co., Boston. The details of the sale were made by T. G. Meachem, president, and J. W. McCrea, general sales agent, of the Palmer-Moore Co., who recently returned from Boston.

Invents Novel Control Device—J. E. Murphy has invented a mechanical contrivance for auxiliary control of an automobile. When a novice is learning to drive this control will be utilized. The driver sits with the novice and by the device controls the clutch, brake and gas. The novice simply turns the wheel. In turn the driver turns over each detail to the beginner, by the autoamtic control retaining the supervision of each feature until that time. Patent has been applied for.

Opens Office in Detroit—Because of its extensive dealings with Detroit manufacturers, the Acklin Stamping Co., of Toledo, has opened a branch office in that city under the management of W. C. Acklin, secretary of the company. The office is located in the Ford Building. Secretary Acklin will spend a portion of each week in Detroit. The company reports that shipments during April were the largest in its history, and that the business outlook for the coming season in the metal stamping trade is unusually promising.

Purchases Fond du Lac Agency—Robert Zinke, president of the Zinke Mercantile Co., Fond du Lac, Wis., has purchased the business and stock and garage of the Crescent Motor Co., of Fond du Lac, from W. C. Reinig, the chief stockholder. The deal includes the agencies for the Chalmers, Studebaker, Overland and Saxon cars. Mr. Zinke will continue the business under the same name, but will not assume active management. The garage at 56-60 North Main street is one of the largest and best equipped in Wisconsin, outside of Milwaukee.

WALSTAD HAND CONTROL—A novel device is shown in Fig. 1 and it makes possible the easy operation of a car under a variety of disabilities and physical hinderments.

The device consists of three levers and a frame clamped to the steering column. From the levers three steel rods pass through the dash to bell cranks under the hood. The movements of the latter are communicated beneath the floor to the transmission case. The lever on which the driver's hand rests in the picture is the transmission brake and the lever just above this is the clutch. The lever on the opposite side of the column actuates the reverse band.

All three levers are self-locking in any position, and self-returning when released by a slight pressure of the fingers. For example, by pushing the clutch lever from its present midway or neutral position down still farther on its segment, low gear is obtained. Spring pawls within the lever engage the teeth shown on the inner edge of the segment, thus locking the lever in the low position until at a touch from the driver it returns upward toward the steering wheel into the high gear position. The fulcrum ratios of the mechanism are such that little muscular effort is required. One hand is always free for purposes of steering.

The pedals act with the levers at all times. Hence, at the option of the individual driver the car may be operated with the feet alone, with the hands alone, or with both together. A pawl key in each lever makes any combination possible in a moment.

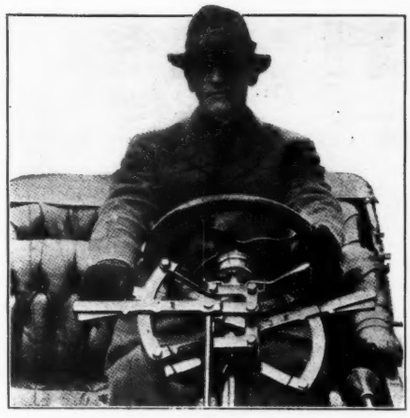

Fig. 1—Walstad hand control. It enables a cripple to operate a machine

Gresser Shock Absorber—A shock absorber that presents many interesting features has recently been introduced by the Buckeye Suspension Co., Cleveland, O. As shown in Fig. 2 it closely resembles the ordinary friction type, but the shock absorbing action is obtained by two coil springs A, which are fastened to one arm of the device at B and to the other arm at C. This shock absorber acts in both directions.

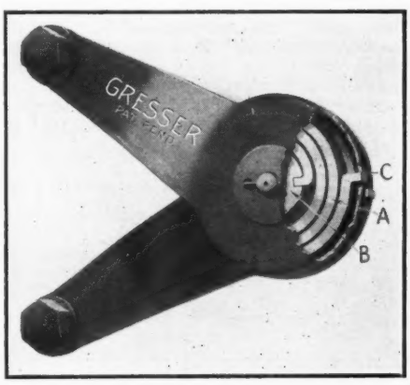

Fig. 2—Gresser spring shock absorber

The special feature claimed for it is that a limited amount of play is offered to the springs without the shock absorbers producing any effect, but with a larger movement excessive oscillations of the springs are effectively controlled. This is explained by the fact that with a 7 or 8-inch leverage the outer coils of these springs will offer practically no resistance when wound at an angle of 12.5 degrees, for instance. With this leverage approximately 1.5 inches play above and below the normal position is allowed, or 3 inches in all.

The Gresser shock preventers are built in one size for cars over 1,500 pounds and are sold for $50 per set of four and $25 per pair.

Perfection Ford Starter—The Perfection Auto Starter Co., of Denver, Colo., is offering a mechanical starter for Ford machines, in which a ratchet operated pedal is used for cranking. It is simply attached to the car with the use of a few bolts and nuts furnished with the device. It is sold for $25.

Keystone Shock Absorber—The Keystone shock absorber is a supplementary spring type that replaces the rear shackles and it is designed to obviate the difficulty due to the fact that a flat spring will not regain its natural position quickly enough to meet each successive jolt. Referring to the illustration, Fig. 3, it will be noted that two heavy coil springs are used, these being made of round stock.

The Keystone is made for cars varying from 1,000 to 4,500 pounds and special types are made for trucks. It is stated that a set can be attached in 30 minutes. The price is $30, with a guarantee of satisfaction or the refund of the purchase price, after 15 days' trial.

Peoria Accelerator for Fords—An accelerator attachment, Fig. 4, for Ford cars, one that does not mutilate or interfere with the removal of the floor boards, is neat appearing and easily and conveniently operated, is manufactured by the Peoria Accessory Co., Peoria, Ill.

It consists merely of a pedal shaft that is bracketed to the dash as shown, the pedal pulling a double cable that passes between the cylinders to the throttle arm after running over a pulley. A coil spring attached to the dash holds the throttle closed when the pressure of the foot is removed.

Tilton Endless Fan Belt—A fan belt that is claimed to be an improvement over present types is the Tilton endless fan belt, manufactured by Lockwood & Dunlap, 1332 Addison Road, Cleveland, O.

Each individual belt is made to whatever size required, on a special machine that produces each belt all in one piece without any laps or joints of any description.

It is impossible for this belt to either shrink or stretch, it is stated, and on account of its special construction water, oil and heat have no effect on it.

Barco Muffler Cutout—The Barco Brass & Joint Co., Chicago, is marketing a cutout made of malleable iron which is clamped around the exhaust pipe and requires that the pipe have a V-shaped cut made in it. The bottom of the valve is solid and the seat is beveled. The prices range from $2.25 for the 1-inch to $4.50 for the 3 1-3 inch, all bored to exact size.

Ward-Leonard Rheostat—A new rheostat which can take care of from one to four battery cells at a charging rate of 8 amperes has been brought out by

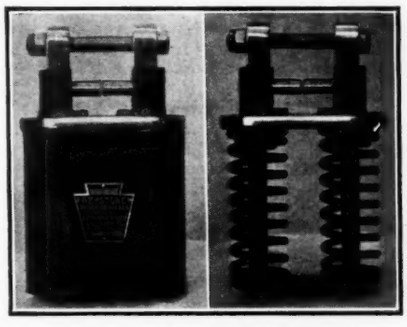

Fig. 3—Keystone shock absorber

Fig. 4—Peoria Accelerator for Fords

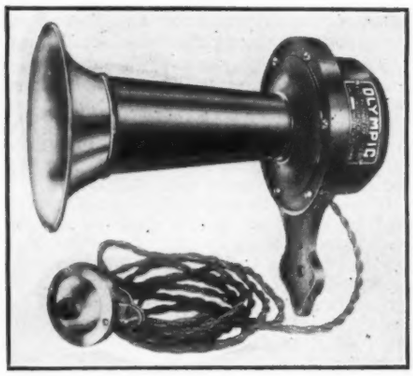

Fig. 5—Olympic electric buzzer horn

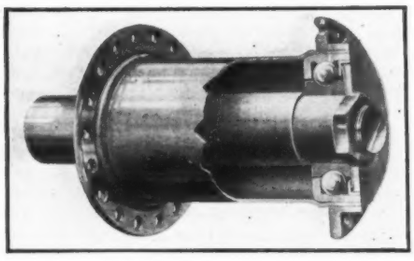

Fig. 6—Harris & Reed cyclecar hubs

the Ward-Leonard Electric Co., Bronxville, N. Y. The rheostat is inexpensive and is only 11 inches square by 3 1-2 inches deep.

Olympic Electric Horn—A new horn of the buzzer type has been brought out by the Electric Spark Appliance Co., Brooklyn, N. Y. It is shown in Fig. 5.

The new horn contains only one electric coil completely inclosed in a metal casing. This feature adds efficiency and is a perfect protection to the winding which is thoroughly impregnated. The springs are so constructed as to prevent their crystallization; it being stated that according to a recent test one of these horns stood the test of 156 hours of continuous blowing and at the end of that time it was found to be in perfect condition.

The price complete with wiring and push button is $5, and a choice of black and brass, black and nickel or all black finish is given. Should the Olympic fail to operate at any time during the first three years of its service it will be repaired without charge.

Harris & Reed Cyclecar Hubs—Special hubs for light cars, small cars and cyclecars have recently been brought out by Harris & Reed Mfg. Co., Chicago, Ill.

The structure, Fig. 6, is patented and consists of the best grade of seamless tubing with shoulders rolled cold at each end. Outside of the shoulders are cut perfect threads and upon these are bolted the flanges which are made of cold rolled soft sheet steel. After these flanges are threaded to jam against the shoulder, the cup of the annular bearing is forced into the opening of the hub chamber. These hubs are crowded against a cut shoulder which is rolled upon the barrel, at the same time that the shoulder is rolled upon the exterior.

In forming the cup of the bearing it is rolled with a force pressure and as a result the stock immediately beneath the balls is denser and harder.

The cones for these balls are ground both upon the exterior and interior with one chucking, this guaranteeing the concentricity of these two surfaces.

The hubs are made complete with a standard distance between the exterior faces of the annular cones and thus all danger of misadjustment is avoided. These hubs are made with brake shoe and sprocket attached when desired.

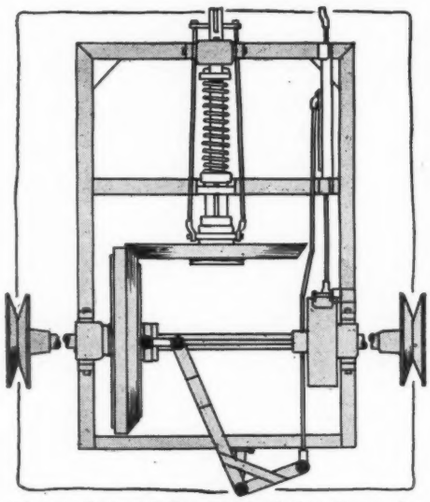

Fig. 7—Roth friction transmission for cyclecars

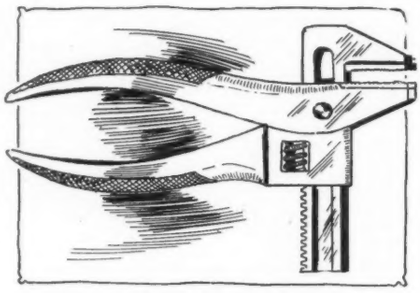

Fig. 8—Starrett expansion pliers

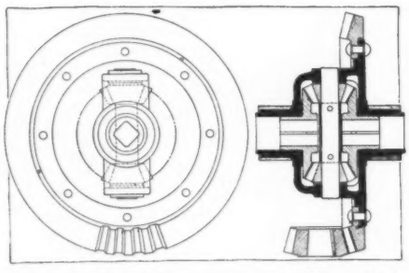

Fig. 9—Grant-Lees cyclecar differential

Roth Cyclecar Parts—Complete friction transmissions for cyclecars, ratchet pedals, etc., are manufactured by H. C. Roth, 2922 Cottage Grove avenue, Chicago, Ill.

One type of transmission is illustrated in Fig. 7, this one being designed for a car with a motor placed longitudinally at the front and with belt drive from a jackshaft without a differential.

This transmission gives four speeds forward and one reverse, drive on high being attained through the contact of the outer edges of the disk and wheel, which are beveled to give rolling contact and thus minimize wear. The center of the disk is raised so that the pressure between the surfaces is increased when low and reverse speeds are engaged.

The price is $35 complete.

Starrett Expansion Pliers—A device, Fig. 8, that is half pliers and half monkey wrench and that partakes of the good features of both, has recently been brought out by the L. S. Starrett Co., Athol, Mass. It consists of a movable jaw that is governed by a small worm the same as on an ordinary wrench. On this member is pivoted the lower jaw of the device.

Thus the device is not only exactly adjustable to the size of work in hand but by means of the handles the work may be firmly grasped. Since the required movement to grip the work is very small the fulcrum is placed very near the jaw and this enables a larger leverage than usual to be employed.

The pliers sells for $2 when finished plain and $2.25 when finished in nickel.

Grant-Lees Differential—Fig. 9 illustrates a differential for small cars and cyclecars that is manufactured by the Grant-Lees Gear Co., Cleveland, O. It is a conventional design in which two pinions are employed. The differential gears are squared to receive the axle ends and the crown gear is riveted to the differential housing.

Knopf Hub Odometer—A hub odometer which records graphically the starts and stops and the time of each, the total mileage of the car, the mileage per hour and which operates on the gravity principle is announced by the Knopf Bros. Mfg. Co., New York. This instrument, shown in Fig. 10, records on section paper as shown in the illustration, the movements of the car. Here each cross stroke represents 1-2 mile of travel and each number on the edge of the tape represents the time in minutes, while the large numerals show hours. Stops are shown by straight lines parallel with the tape. The total mileage is recorded in the odometer which is always visible, and which counts up to 10,000 miles. The instrument is particularly adaptable for commercial car and taxicab use and may be installed by the average mechanic in a short time.

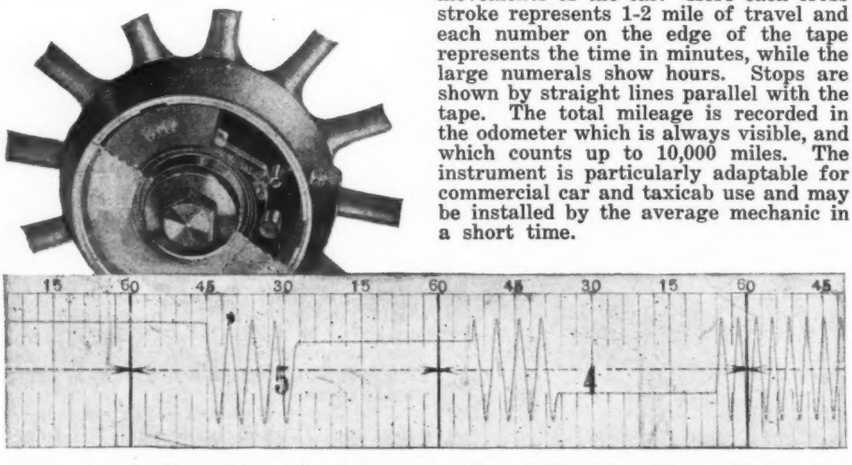

Fig. 10—Knopf hub odometer. It shows stops, total mileage and mileage per hour